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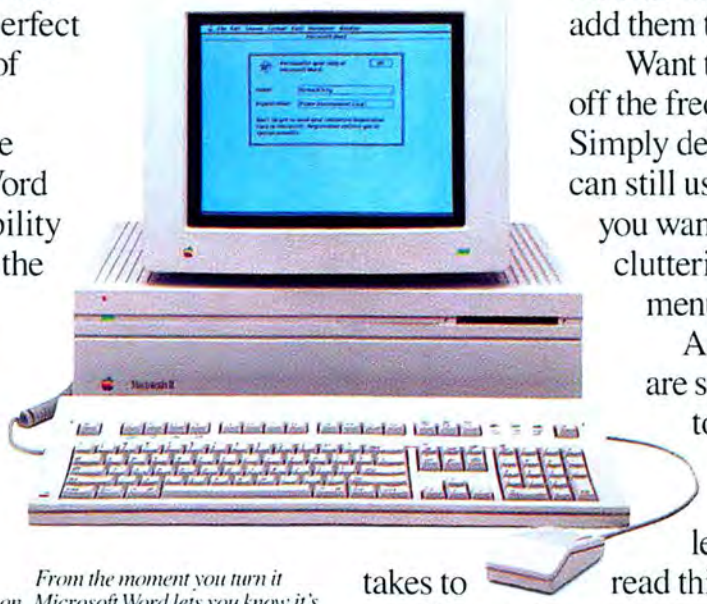
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Your passport to

We have yet to meet the word processor that's perfect for everyone right out of the box.

Which is why we've built into Microsoft Word version 3 the unique ability to be customized to fit the way you work.

From modifying menus to filing away frequently used formats to designing your own dictionary, Word gives you more ways to turn our word processor into your word processor.



From the moment you turn it on, Microsoft Word lets you know it's yours and yours alone.

Don't like what's on the menu? Change it.

Menus should list the fonts and formats you use all the time. Not the ones you hardly ever use.

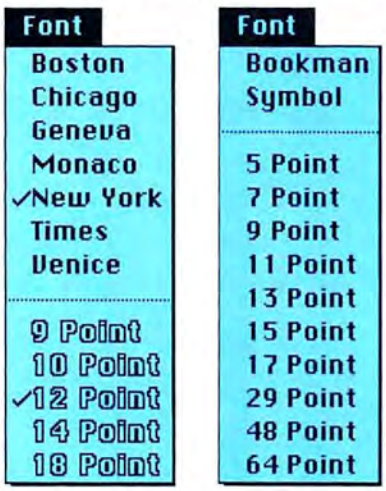
So you'll appreciate how easy it is in Word to add the formats you want. And remove the ones you don't.

Want quick access to your LaserWriter fonts, paragraph borders, or some other favorite format? Just add them to your menus.

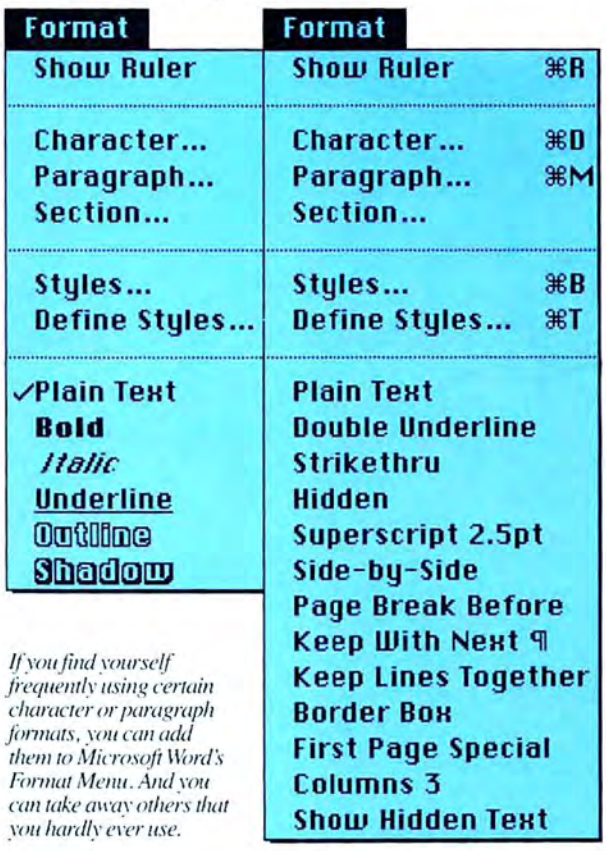
Want to take Monaco off the frequent font list? Simply delete it. You can still use it whenever you want to; it's just not cluttering up your menu.

And Word's menus are so easy to customize, you can make a change in less time than it takes to read this sentence.

You might say they're your passport to easier writing.

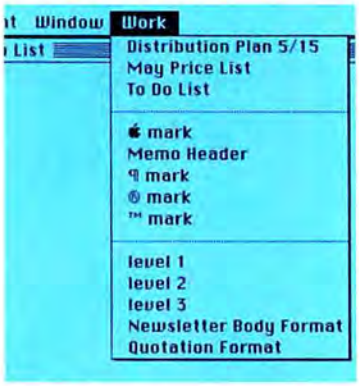


Microsoft Word makes it easy to create custom menus that list as many fonts as you want to work with.



If you find yourself frequently using certain character or paragraph formats, you can add them to Microsoft Word's Format Menu. And you can take away others that you hardly ever use.

) better writing.



Word is the only word processor for the Macintosh® that lets you create your own menu. List your most frequently used filenames, glossaries, and styles on a Work Menu where you can get to them quickly.

Add a menu. Subtract steps.

Microsoft Word lets you add a special menu that saves so much work it's called the Work Menu.

Add a Work Menu to the typical office and you may just see some very atypical productivity increases.

That's because the Work Menu saves steps by putting your favorite formats, boilerplate text entries, and even document names a quick mouse click away.

More changes for the better.

There are lots of other ways you can make Word yours and yours alone.

Create your own custom styles–like that tricky boxed paragraph with the 13-point line spacing, tight letterspacing, and boldfaced, italicized text. And re-use it instantly for consistency in one document or across several.

You can also have your own glossary for storing text that you'd rather not retype every time you need it. Part 1(b) of the standard agreement, for instance.

And, of course, you can even customize Word's 80,000-word dictionary by adding your own unique terms.

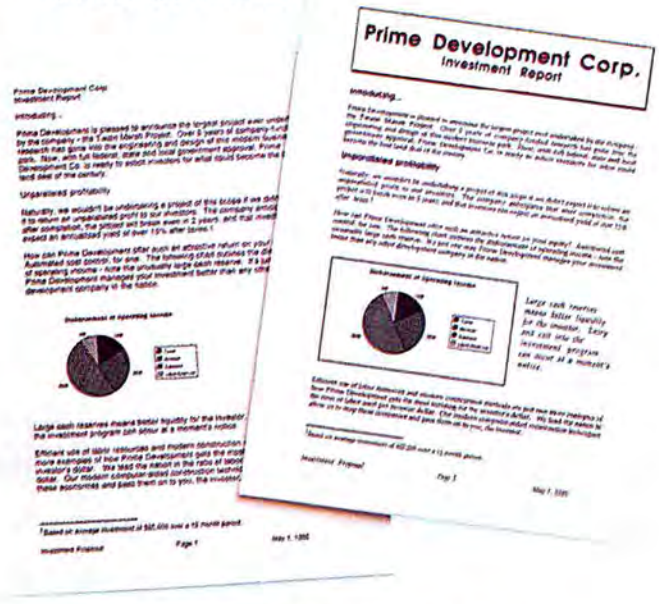
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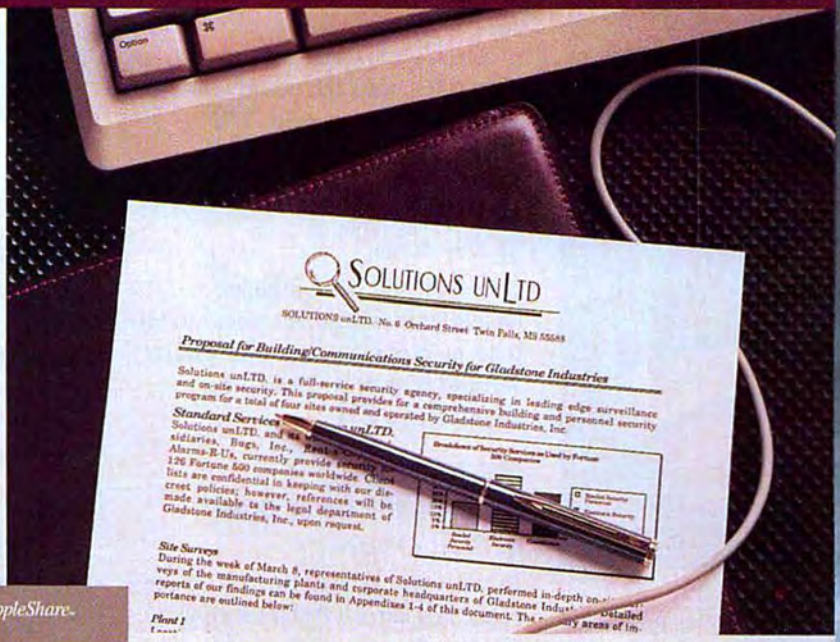
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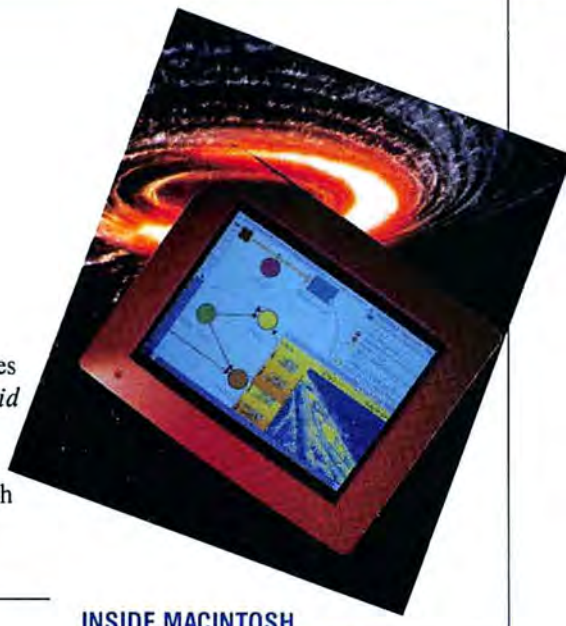
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by Chip Carman, Michael Fischer, and Steve Rosenthal

Everything you ever wanted to know about mass storage. MacUser Labs tests 22 hard disks of 100 megabytes or more. Find out why you may want one and which one best answers your needs. **122**



MASS STORAGE

Optical Horizons

by Jon Zilber

Compact discs aren't just for music anymore. We take a look at where CD-ROM and WORM technology is now, where it's going, and why you should be interested. **157**

Back It Up!

by Ben Templin

It's a bore, it's time-consuming, and it's absolutely necessary. The value of backing up data regularly is something almost everyone learns the hard way. Tape back-up systems may take some of the sting out, but they don't come problem-free. **171**

Search and Rescue

by John Gillett

The cure for "unreadable" floppies and fading hard drives: *The 1stAid Kit.* It's an easy-to-use recovery program with a manual that's a virtual textbook for the Macintosh hierarchical file system. **179**

RESOURCES

Can We Talk?

by Jon Zilber

It talks, it squawks, it balks! MacRecorder digitizes sound to bring the sound of music and the spoken word to *HyperCard* and other applications. **214**

MACINTOSH II

Quick on the Color Draw

by Scott Knaster

In this excerpt from Scott Knaster's book, *Macintosh Programming Secrets,* he gives us the inside scoop on Color QuickDraw. **230**



INSIDE MACINTOSH

Chairman of the Keyboard

by Salvatore Parascandolo

What to do when your keyboard goes on the blink. We offer a step-by-step description of what you can do to rectify the situation without a trip to your local computer repairman. **241**

BUSINESS FINANCE

A STELLA Performance

by Dan Rasmus

STELLA is a powerful simulation/modeling program that takes the guesswork out of planning. It's fast and faithful to the Mac interface, but you'll need to get acquainted with the theory of "system dynamics." If you run simulations, it's worth the effort. **194**

MUSIC

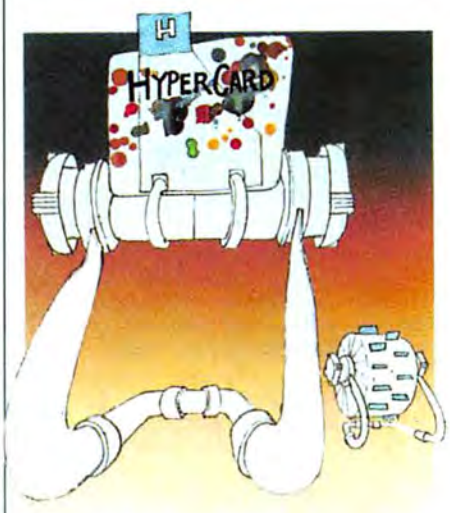
Itty Bitty MIDI

by Paul Lehrman

Apple's new MIDI is not exactly high end; it has one input, one output, and a 1-MHz clock rate. It's not the device itself that is so important, but rather Apple's public support of the MIDI standard. **206**

VOL. 4, NO. 6 JUNE 1988

Cover Photo by Jook Leung
Hard drive from Rodime.



HYPERCARD

Flash Cards
by Laura Johnson and Victoria Juarez
Another batch of some of the more interesting *HyperCard* stacks we've seen recently. **250**

COLUMNS

Editor's Desktop
by Frederic C. Davis
Backed Up Your Data Lately? **13**

The Open Window
by Steven Bobker
The Appliance Mac. **17**

The Macintosh Community
by Neil L. Shapiro
Paying for What You Get. **29**

Pinstripe Mac
by Robert R. Wiggins
Strategic Infiltration. **71**

Mainstream Mac
by Jim Seymour
SCSI Power. **65**

Card Tricks
by Michael Swaine
Adaptive Behavior. **85**

Two Bits' Worth
by Henry Bortman
The *HyperCard* Workstation. **79**

The Help Folder
by Chris Espinosa
Answers From the Mac Team. **89**



The Devil's Advocate
by John C. Dvorak
The CD-ROM Burger King Column. **312**

DEPARTMENTS

Letters
from the Mac community
Readers have their say. **33**



New On The Menu
edited by Jon Zilber
Latest updates, News Line, and more. **42**

Quick Clicks
Capture, Classic Professional Graphics Display, Deluxe Music Construction Set, GO, HyperBook Maker, Image Studio, Images With Impact!, MacWrite 5.0, QuickShare, Reader Rabbit. **100**

MiniFinders
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Coming Soon 10

Advertiser Index 94

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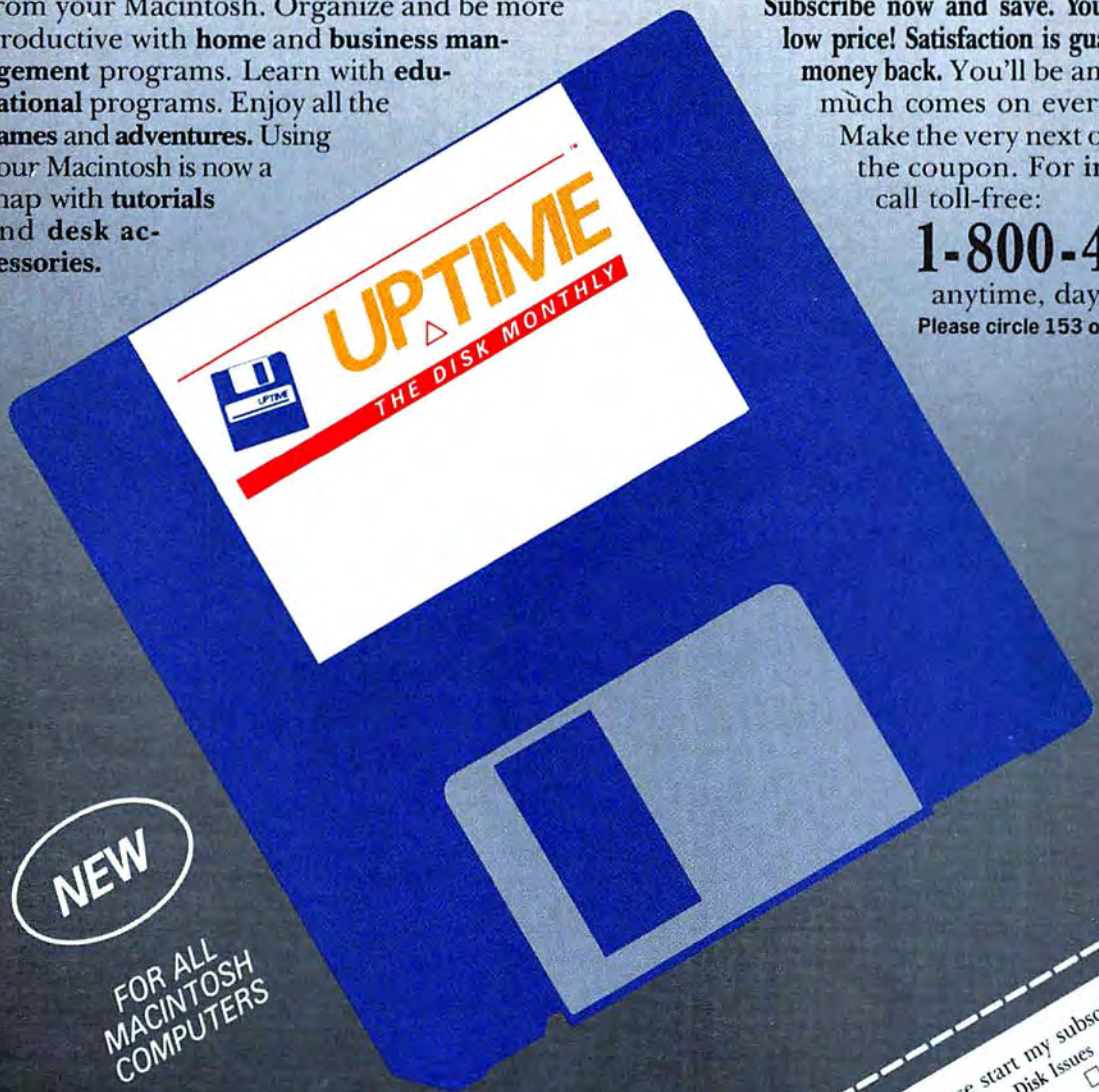
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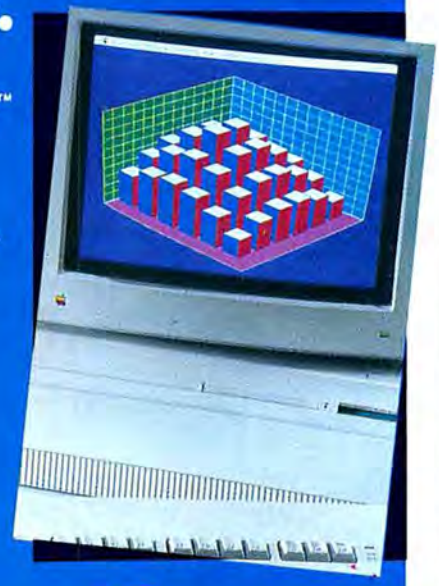
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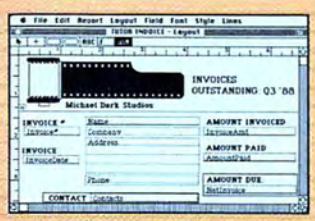
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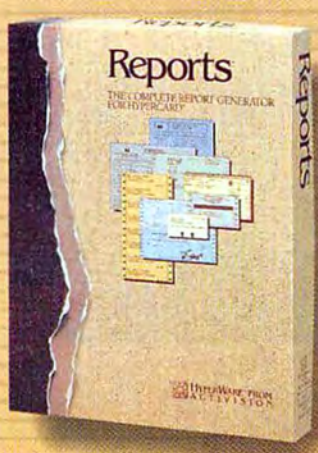


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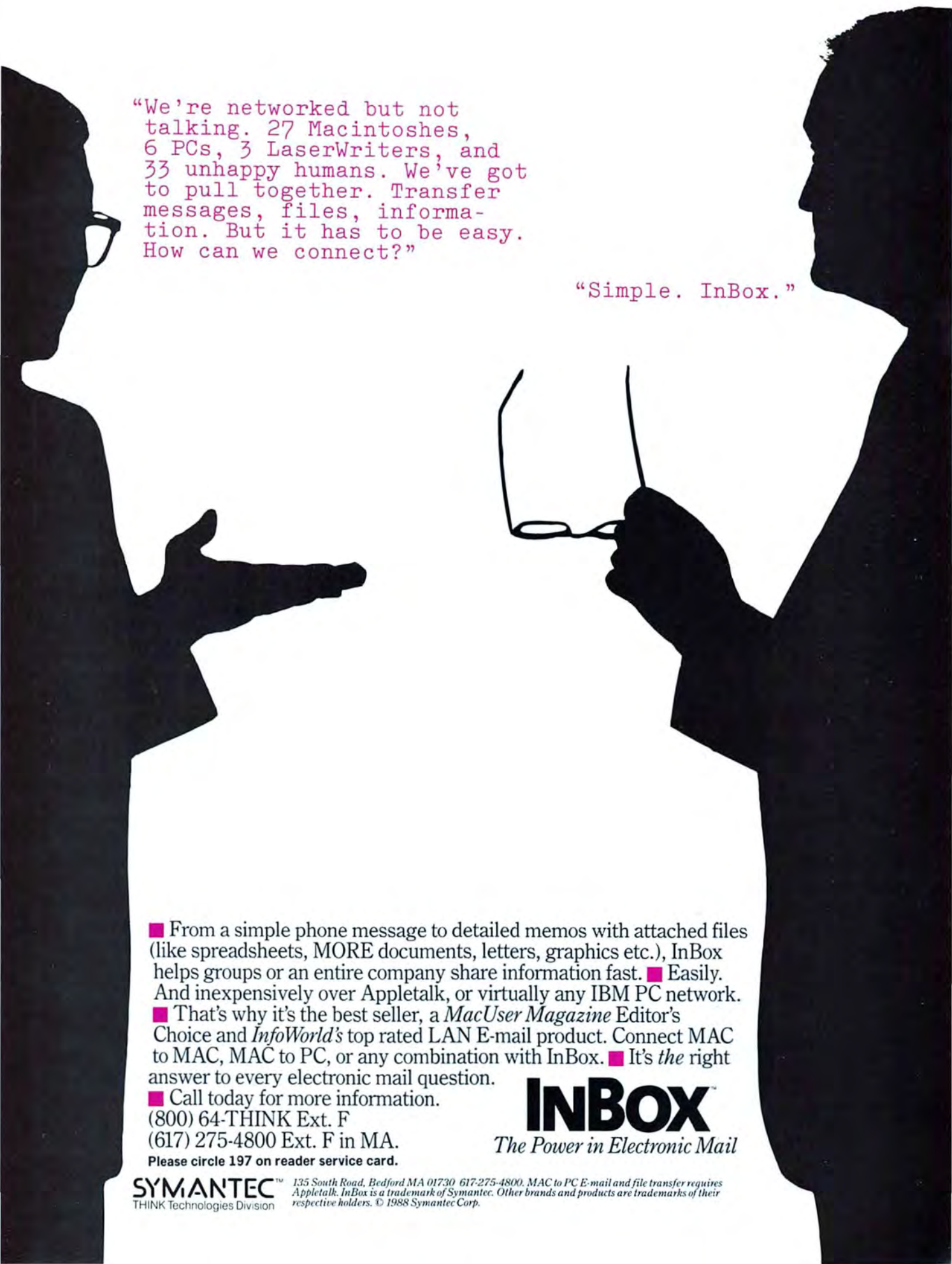
P L U S

John Dvorak on the state of the Mac. **Neil Shapiro**'s Macintosh Community. **Robert Wiggins'** Pinstripe Mac. **Steven Bobker** with The Open Window. **Jim Seymour**'s The Mainstream Mac. **Michael Swaine**'s Card Tricks. **Frederic E. Davis'** Editor's Desktop. Answers from the **Mac Team**. Three pages of hints and tips. Over 300 **Mini-Finders.** An expanded **Quick Click** section, now including hardware.

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Backed Up Your Data Lately?

What's the difference between a fatal car crash and a fatal hard disk crash? After your hard disk crashes you *know* you're dead. This joke is a harsh reminder of how important it is to back up your data. Reminding you to back up your data may seem like belaboring the obvious, but it's definitely a message worth heeding. Although people wince at the cost of hardware and software, your data is usually more valuable and much harder to replace than your computer system.

LEARNING THE HARD WAY

It would be nice to learn good back-up habits the easy way, by reading about it in a magazine, for instance. But unfortunately most of us learn the hard way — it takes a data disaster to teach us the value of making back-up copies of important files. One obstacle to learning good back-up habits is the relative dependability of today's technology. Twenty years ago when I started programming BASIC on the mainframe at Dartmouth, you had to back up your data every 15 or 20 minutes. The whole system was prone to frequent crashes and you never knew whether your files would even exist the next time you logged on. The floppy diskettes and hard disk drives used with today's Macintoshes are quite reliable. Unfortunately, this reliability can lull you into a false sense of security that may lead you down the path to disaster. Remembering to back up your data is like remembering to buckle up your seat belt: accidents are rare and the seat belt seems like a nuisance, but if you are one of the rare unfortunates who does have an accident, it can make all the difference.

SOFT SELL

Making back-ups is not just an issue for hard disks; there are also points



that floppy users should remember. Most important with floppies is to remember that merely making a duplicate copy of a file on a single diskette is not enough; important files should exist on at least two separate floppies just in case one of them goes bad. Also, be wary of single-sided diskettes that have been re-initialized as double-sided. That strategy can work most of the time, but I know from dismal personal experience that an uncomfortably high percentage of those single-turned-double-sided disks can go bad without warning. Important data (and their back-ups) should be kept on the best quality diskette you can find. Use old (or otherwise questionable) diskettes for stuff like shareware or downloads from on-line services that are easy to replace if the diskette crashes.

HARD SELL

If you have a hard disk, a good back-up system is a necessity — not a frill. If you have a relatively small hard disk (40 megabytes or under), you may be able to get by using standard Mac 800K disks as the way to back up your data. If you take this approach, it's definitely worth getting a hard disk back-up utility program that helps automate the task. The good utilities let you back up only the files that have been modified since the last back-up. If you are using a large-capacity hard disk, especially one of the over-100-megabyte models covered in this month's issue, you should invest in a dedicated back-up device such as a tape drive, Bernoulli drive, Winchester cartridge drive, WORM drive, or other mass storage device with removable media. One advantage of the SCSI connection system used by the Mac and all of its mass storage devices is the ability to connect up to seven devices to a single Mac. This means that you can buy a single tape drive or other back-up device and go around the office easily attaching it to a hard disk drive, backing up the data on that drive, and then easily disconnecting it and moving on to back up the next drive. And after you make your back-ups — whether it is onto floppies, tape, another hard disk, or whatever — it's a good idea to store the back-up in a different building. If you keep your back-up data at a different location, you will be better protected from data loss resulting from theft, fires, or other catastrophic events.

Another back-up strategy is to back up your data onto another hard disk. Consider this option if your work is very valuable and you need to back it up often; it is the fastest, easiest way to back up a hard disk. A variation on this theme is to back up your data onto an AppleShare or TOPS file server. Backing up over regular AppleTalk (now called LocalTalk) is fairly slow, but if you have the luxury of having an EtherNet/AppleTalk network, then things really zip along. And speaking of file servers, the hard disks attached to your file servers are especially im-



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portant to back up regularly since losing all the data on a file server is a good way to make a lot of people very unhappy all at once. Some networks rely on "distributed back-up" — or to put it another way, people are expected to make their own back-up copies of data they store on the file server. Although this approach is easier for the network administrator, it is not as dependable or reliable as making a regular back-up of the file server.

HOW MUCH IS ENOUGH?

How often should you back up your data? Well, I guess that's between you and your conscience. A good way to think about it is to ask yourself, "How many (hours/days/weeks') worth of data do I mind losing?" If you only use your computer a couple times a week, maybe once a week is enough. But for most businesses I recommend backing up your data at least once a day if you can manage it, especially in the case of large file servers. Good back-up software will let you set up the back-up process to take place automatically at night so as not to interfere with business hours. If your business' data is especially critical (such as financial transaction data) you may want to back up your data more than twice a day—(during lunch break perhaps) or even back up continuously during the day to another hard disk.

> If you keep your back-up data at a different location, you will be safer from data loss resulting from theft, fires, or other catastrophic events.

Another factor to consider in selecting a back-up system is to determine whether or not the back-up software helps overcome the problem of file fragmentation. Many files, particularly long files, are not written onto the hard disk in a single, continuous data stream because there may not be enough continuous blank spaces left on the disk; instead a file may be broken up ("fragmented") into smaller chunks in order to fit it onto the available blank spaces on the disk. Fragmentation tends to get worse the more you use your hard disk because creating and deleting files creates many discontinuous areas of data on the disk surface.

Although the hard disk keeps track of where the various files and chinks of files are on a disk, the more fragmented the files, the longer it takes the disk to read and write them. Fragmentation can eventually lead to a significant drop in the performance of a hard disk, so you should find out whether the back-up software you plan to use helps alleviate the fragmentation problem. In order to remove fragmentation you need a back-up system that reads files from the hard disk and copies them to the back-up device file-by-file. That way when you restore the back-up onto your hard disk you can re-initialize your hard disk and write continuous (i.e., not fragmented) files back onto it. Some back-up systems, on the other hand, merely copy all the bits off the hard disk onto the back-up device. This means that when you restore files all the bits are written back onto the hard disk and the files remain fragmented.

Experience indicates that people do not back up their data enough, and there are many horror stories that back up that claim. Backing up data on a daily basis may seem frivolous but just imagine: you're in charge of the office network and the file server crashes; the big question is how long ago was the last back-up made? If you produce a back-up tape that was made yesterday (or better yet at lunch), you'll be considered a hero. And if the back-up is ancient or non-existent, I'd suggest heading for the nearest exit and without taking time to look back. So remember, back up your data: your livelihood may depend on it!

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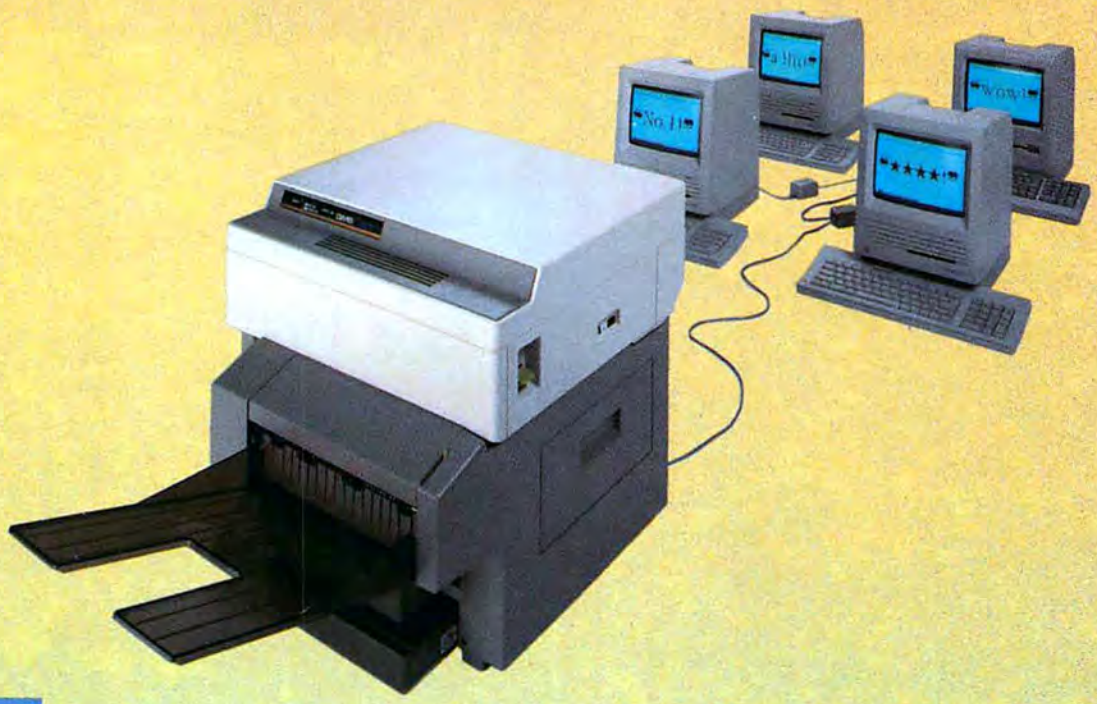
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by Steven Bobker

The Appliance Macintosh

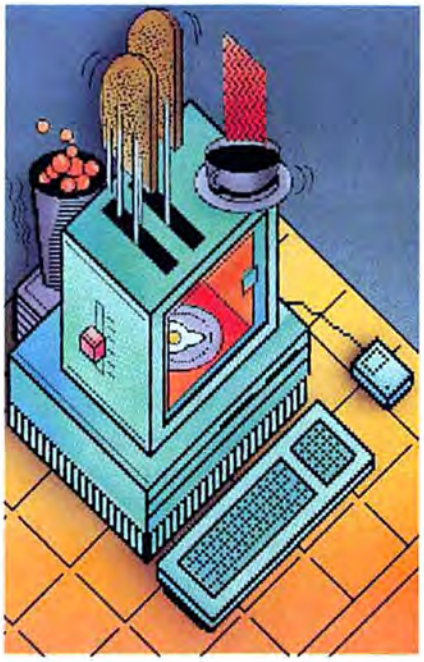
Last month I looked at what Apple is likely to do to protect its position as a leader in the high-end microcomputer market. This month I'll examine what Apple can do and what it might do to increase its share of basic, or low-end, users.

The low-end market appears both attractive and fraught with danger for Apple. It offers the best opportunity to really expand Apple's overall market share. Yes, the spectacular advances in high-end machines, which I expect will continue, will open some doors. But those machines appeal mostly to the committed, those who already have religion. Although these high-end machines are profitable, no matter what their sales figures and actual market share are, they can't attract the huge volume of sales necessary to make substantial gains in today's business environment.

Supporting, promoting, and developing for the high end is not enough. To continue to grow at the rate necessary to support a decent R&D effort, Apple must increase its overall market share. The company must convince people currently not using Apples (and very possibly not using *any* personal computer) to start using a Macintosh.

The current basic machine, the SE, is a very nice introductory machine, and given 2.5 or 4 megabytes of RAM (one of those amounts is sure to become standard as soon as the DRAM chip supply loosens up later this year), is sufficiently easy to use and sufficiently powerful. It's also very connectable.

It's still very much a computer, though, a somewhat esoteric tool that requires some specialized knowledge. Radically better system software and firmware (ROM) will help, but that's a ways off. If you don't much like computers, there's really nothing about the current SE to make you like computers. It's easier to use than MS-DOS machines, but so what? You may spend less time learning how to make the SE do more or less what you want, but there is still going to be a struggle between you and it to get what you want. And you're going to lose a lot.



DIDIER CREMIEUX

Steve Jobs knew exactly what he was looking for when he led the original Macintosh design team. He envisioned an appliance Macintosh, a box so simple that users could approach it as easily as their telephones and consider it basic to their life and/or workstyle.

It would be as transparent as possible and as necessary as possible. The home or workspace without this sort of computer would be as lacking in basics as the home or workspace without a telephone. That was a great goal in 1984, and it's a great goal in 1988.

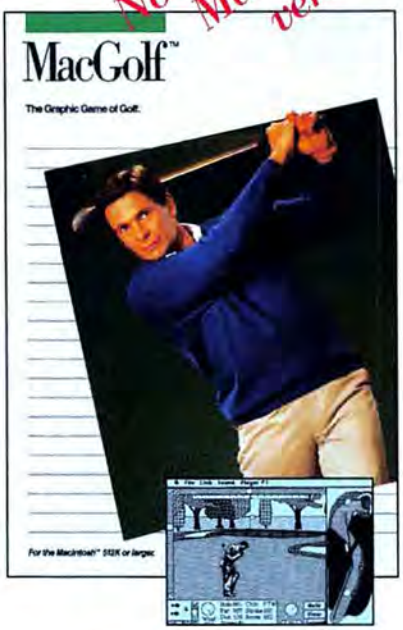
The original Macintosh was never an appliance computer, no matter what the hype said. The newer machines have moved closer to that goal in some ways, but further away in others. The time has come to take some big steps toward a real appliance Macintosh. Apple has always had this machine in mind and has created some interesting prototypes. We haven't seen any of them yet. The reasons are not technical — these are simple computers. And although simplicity often imposes a staggering series of complex design problems, that's not the case here.

You haven't seen Apple's appliance Macintosh because Apple isn't sure whether it should market a low-end Mac. The reasons are complex. First and foremost is the desire to protect the Apple II line for at least another year or so. Apple IIs are still selling, and there is a large and fairly vocal base (of both users and developers) who are committed to the II line. So far, Apple hasn't developed a foolproof rationale and doesn't (or can't) offer strong enough incentives for moving to Macs. From the Apple point of view, a competing low-end computer will only cause confusion in the marketplace and possibly erode overall market share — an unmitigated disaster.

There is also the fear (in my mind nearly totally unfounded) that if Apple markets a low-end Mac, it will make life easier for the inevitable clone makers. Then Apple will wind up not only not expanding its own market share, but fighting to maintain what it already has.

That view ignores reality. The Mac, some Mac, every Mac that's any good, will be cloned. Apple's defense (which will be presented and fought in the courts) will be no different, no matter how simple or advanced the Mac clone is. I don't think Apple has too much to worry about here. And even if Apple loses the legal fight, it's not any worse off — poorer maybe, but still the undisputed technology leader. To not

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market the appliance Mac for fear of spurring clone development is wrong, and in the long term, injurious to Apple's best interests.

Apple has always shown (over the long run!) intelligence. Thus we will see the appliance Macintosh, possibly in early 1989 or more likely late that year or in 1990, when the new operating system software becomes available. Based on what currently exists, here's what I think the appliance Macintosh will be like:

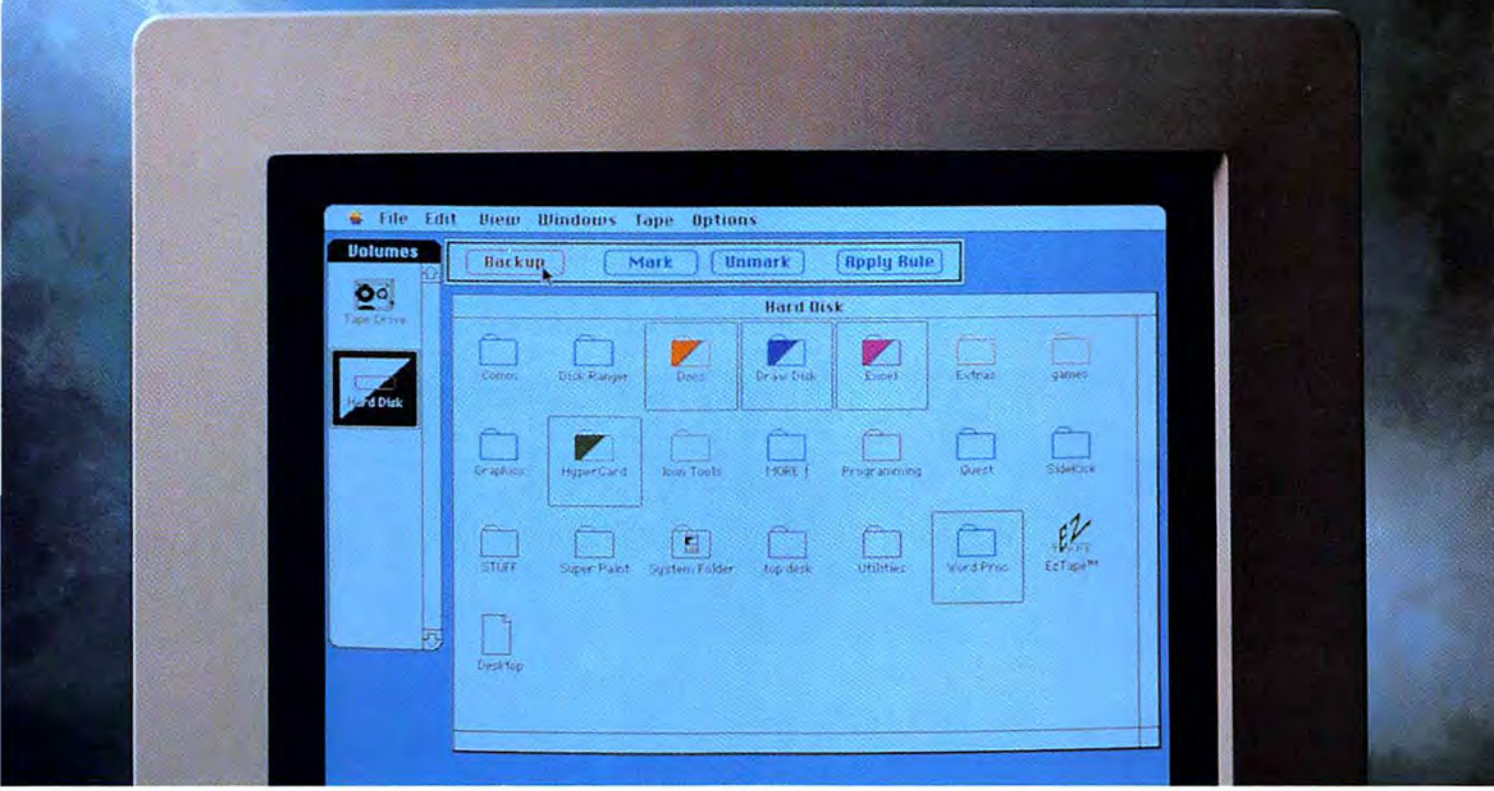
The most important feature will be the price — absolutely and totally. Low end lives on price. The highest possible list price figure is $995 (with keyboard and monitor). That's what it will sell for when it is introduced, but that figure will drop at least $100 and maybe more at its six-month anniversary. Holding the price this low is going to take some serious engineering, but it's not an unreasonable price goal (for either the buyer or Apple).

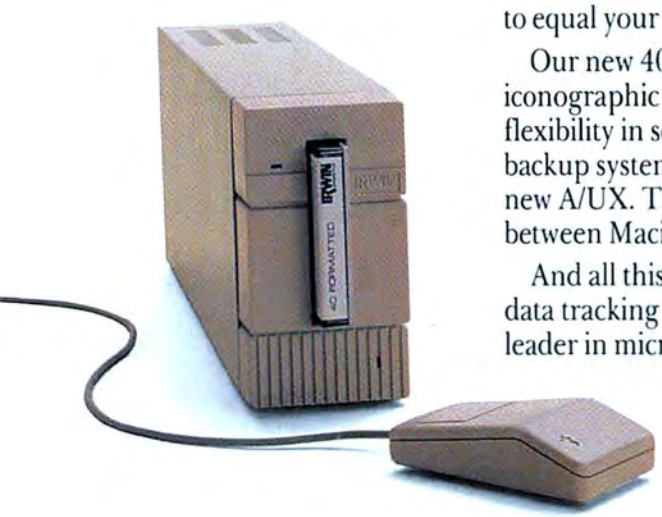
The appliance Mac will probably have 2.5 megabytes of RAM unless the differential cost of providing 4 megabytes is only $25 or so. I don't see that happening for at least a few years.

(An editorial digression: The RAM situation may be turned topsy-turvy by 1989 as the Japanese elect to jump right to 16-megabit SIMMs, skipping the expected generation of 4-megabit SIMMs. That will make all memory considerations moot. Everyone will have more memory than anyone will know what to do with, at least for a year or two.) The central processing unit will be the 68030 running somewhere between 16 and 25 megahertz. Again, the speed will be dependent upon the price. If Apple is buying enough high-speed 68030s for its other machines, the company may be able to drive the price way down.

The appliance Mac will have a built-in hard disk. As with the other components, price will be the sole determinant of the size, but 20 megabytes will be more than ample for the situations where the appliance Mac will be used, and the rumored new, very small 10-megabyte drive will also be adequate (the only question is whether the new technology 10-megabyte drive will be cheaper than the old technology 20-

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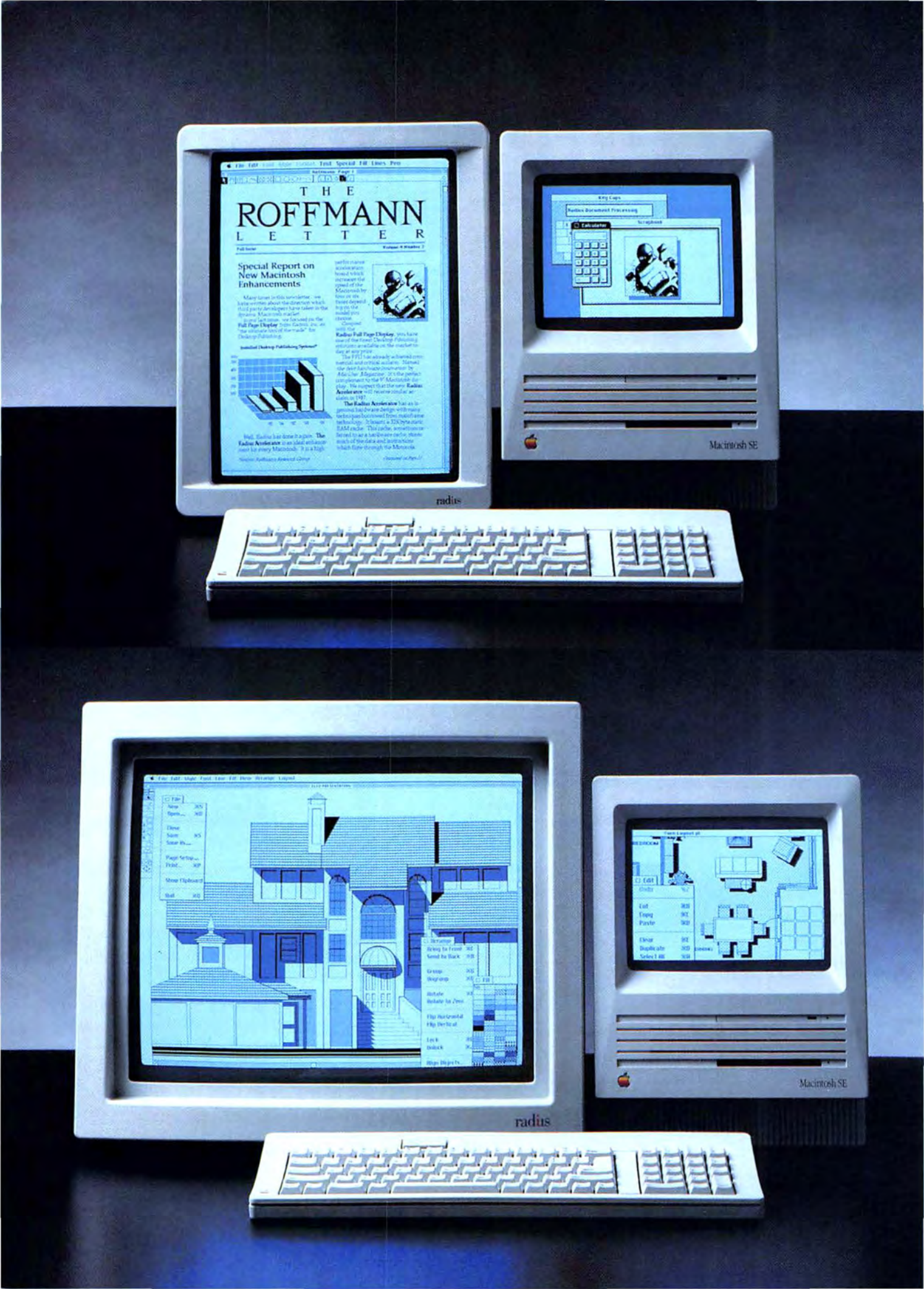
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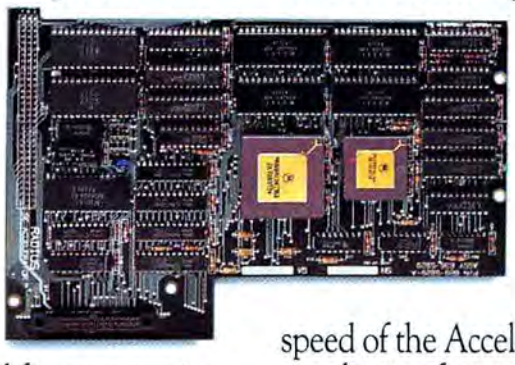

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megabyte drive.) Expect to see one external floppy drive, capable of reading any size and format 3½-inch disk (800K HFS, SuperDrive, and MS-DOS). Don't expect to see anything too radical in storage such as CD-ROM, DAT, or even high-capacity removable media in any guise (other than floppies). There isn't going to be anything even remotely expensive in this box. There will be an expansion port or two. These will not be card slots, however, but cartridge openings accessible without opening the case. They'll be similar to the ROM cartridge slots on laser printers and game machines. Their prime purpose will be to accommodate interface cards for various host computers.

> What will make all this the appliance computer that the Mac always promised to be but never was is radically new system software.

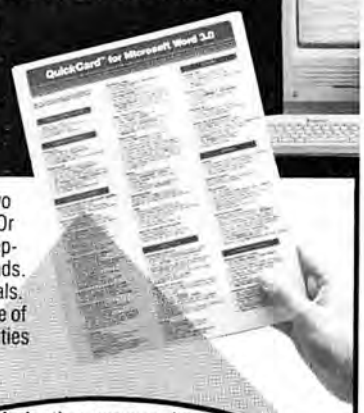
The monitor will be a separate unit, allowing a choice for those affluent enough to take advantage of it. The basic monitor will be a black-and-white, portrait-format (vertical), page-size box (similar in screen area to the current Radius Full Page Display). Recent monitor advances will make this a fairly small (and cheap) unit. Resolution will be equivalent to what's on current Macs.

The keyboard will probably remain an ADB unit. Volume production and technology advances will make today's extended keyboard the standard for the appliance Mac.

All these parts will be combined in user-replaceable modules, making both repair and upgrading simple. The upgrading option is significant, since users will be able to upgrade to whatever is the current middle-of-the-line

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(and possibly even top-of-the-line) units by themselves.

What will make all this the appliance computer that the Mac always promised to be but never was is radically new system software. This software, nearly totally self-contained in a greatly expanded ROM, will rely heavily on artificial intelligence to learn its users' ways and wishes. It will also implement the navigator/agent technology that John Sculley has been so effectively demonstrating and promoting these last few months.

Your software agent will not only make the computer orders of magnitude more transparent and easier to use, it will also be able to interpret and interact with current software to mold it to your needs. The software necessary to do all that sounds far-fetched, but it really isn't. And while Sculley's neat demos appear to be mostly visual gimmickry, the navigator/agent already exists. It simply needs to be developed further and have its final finish put on. If Apple doesn't decide that its marketing is best served by denying its customers its best available technology, you'll be able to buy this machine (if you want it — the navigator/agent software will be standard on all Macs) in 18 to 24 months. Time flies when you're having fun.

I was recently lucky enough to attend Apple's first CD-ROM Developer's Conference. It was held in Seattle and directly followed Microsoft's Third International CD-ROM Conference. It was certainly an eye-opener. For one thing, nearly twice as many people as Apple hoped for showed up. The enthusiasm level was electric. What I saw and heard during those few days sure made me a believer in CD-ROM.

I, sceptic that I am, had thought that CD-ROM was a nice and probably cheap way to store lots of data (a disk can hold 500 megabytes — 500,000K — or so). It was simply a serious mass storage medium. It is that, but it's also lots more. There are possibilities and implications in CD-ROM that will radically change how every last one of us computes. Next month I'll tell you how and why that's going to happen.

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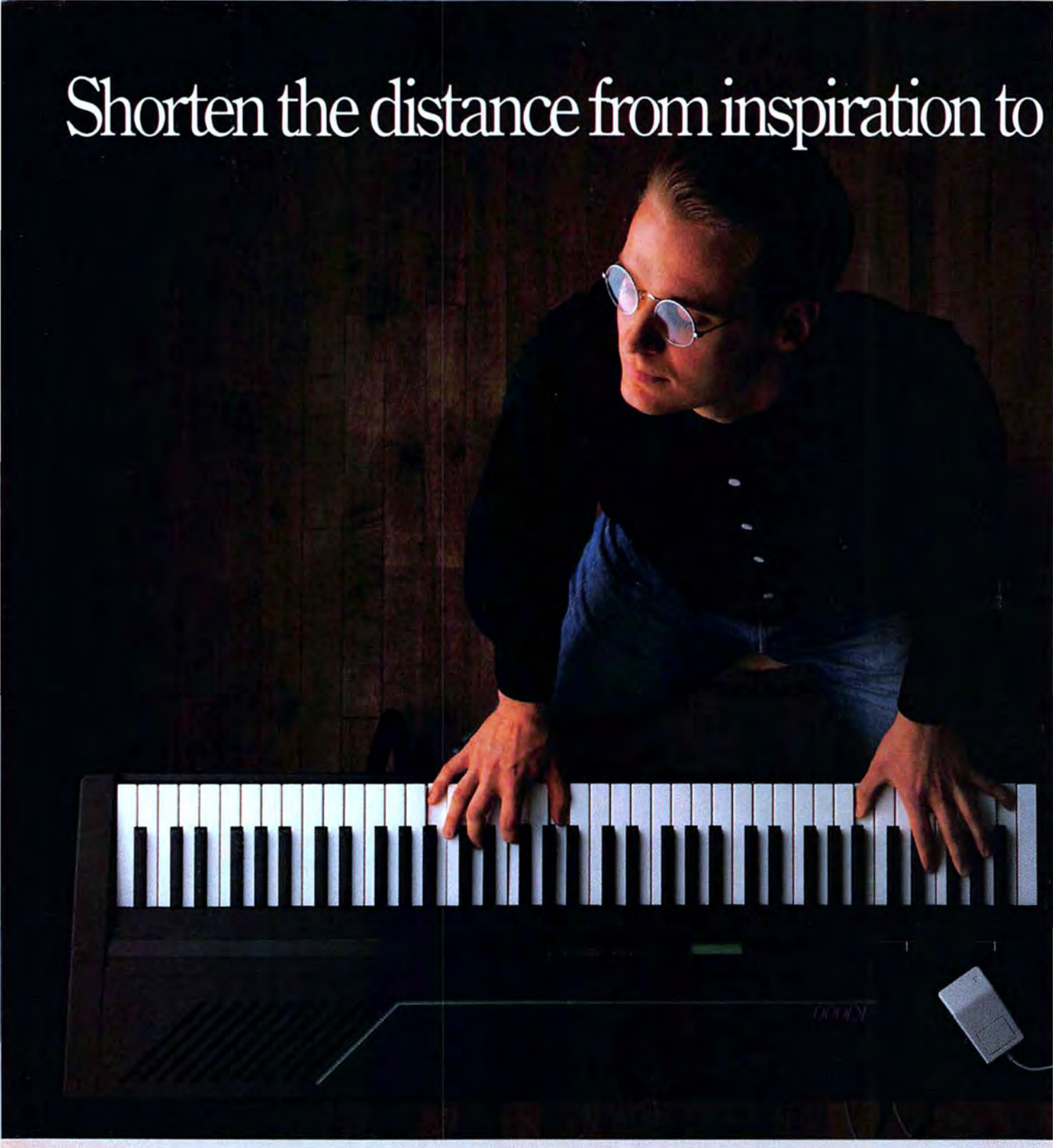
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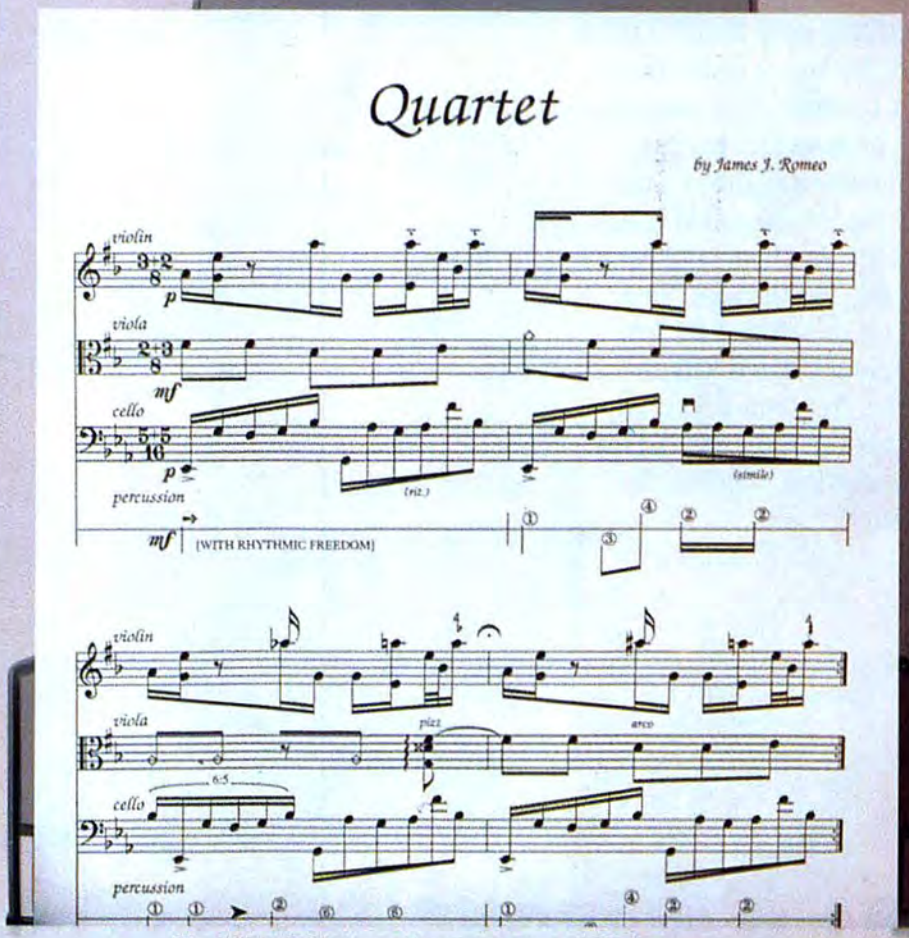
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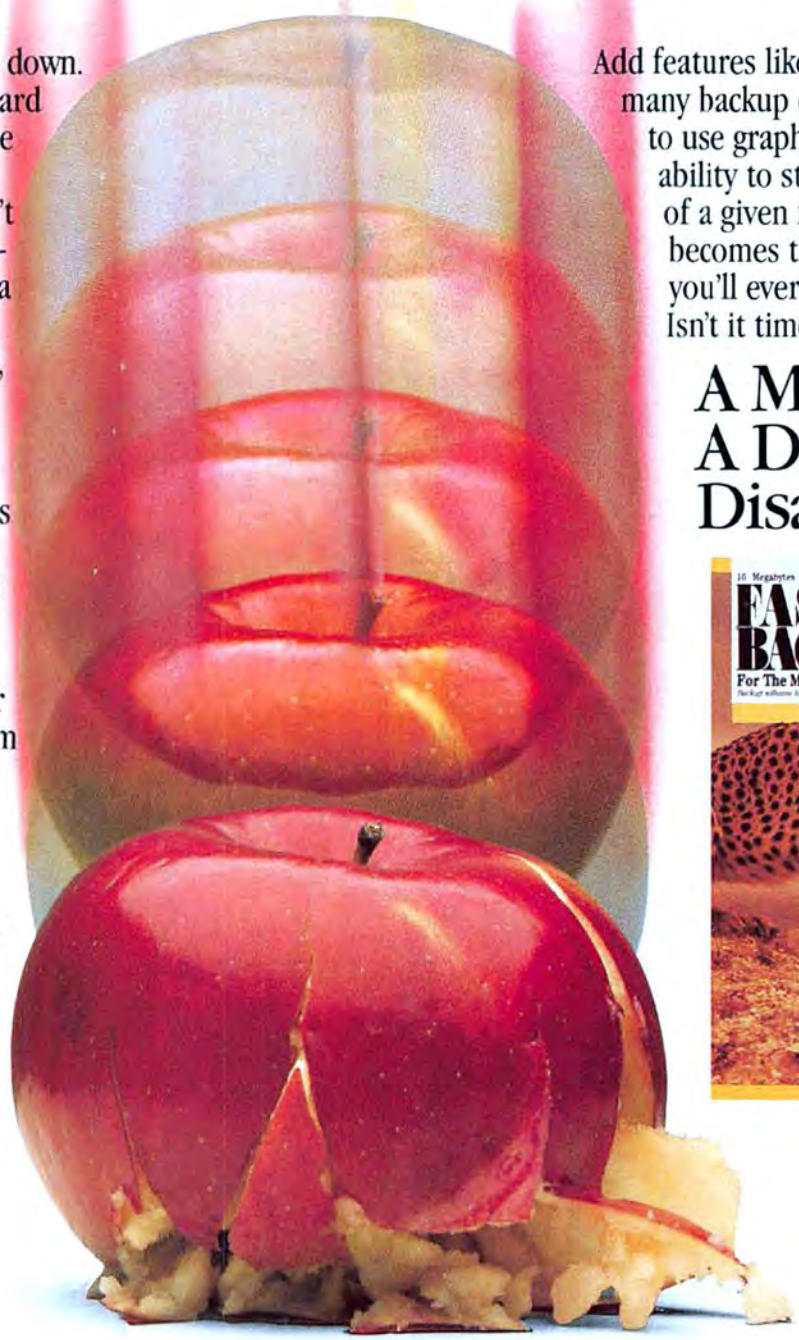
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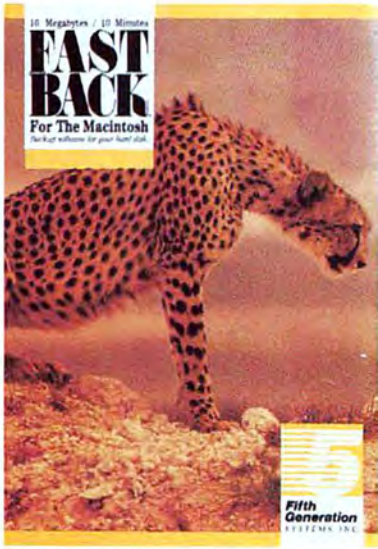
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by Neil L. Shapiro

Paying for What You Get

The precept that ideas can be stolen, that creativity's products belong to the creator, is an area that we in the Macintosh community must consider in detail.

In the past few months, several situations have brought this home to me. They all revolve around intellectual property as seen from different viewpoints. In each of the following situations, I offer my own view, my own "situational ethics." I do so not because I feel my position is the "right" one, and certainly it's not the only one. But it's time that we all began this type of dialogue.

TILTING AT PAYMENTS

They laughed when I sat down to write a shareware game. But, they hadn't reckoned with the power of *HyperCard*. Nor with my uncanny ability to choose a co-author.

Thus it came about that the game of *TILT!* (which simulates a medieval jousting event and which was written with professional illustrator Mike Gilbert in charge of the graphics) has become pretty well known in shareware circles. Although I am hardly another Lofty Becker or John Raymonds, Mike Casteel or Don Brown — I can certainly now see what shareware is like from the author's side.

It can be pretty damn dismal.

So far (in March), Mike and I have received fewer than 20 shareware payments. Yet the game is always judged as good to excellent when the reviews come in.

Obviously, as is the case with most or even all shareware, the vast majority of people who are using and enjoying the program simply are not returning their license fees. Of course, I may be flattering myself — perhaps most people have simply trashed *TILT!*, but that doesn't change the following viewpoint.



JENNY ADAMS

Not paying for shareware that you use is a kind of violation of intellectual property. In this case the ramifications can simply mean that no one profits. The author does not profit by his work. And, the end-user does not profit from further work from a discouraged author who turns his time toward producing in other areas.

Two losers. No winners. Not a very good result from violating the civilized precept of paying for what you use.

JOUSTING FOR PERMISSION

Following our upload of *TILT!* to various networks, I was not surprised that several distributors wanted to redistribute our program.

But I was shocked — aghast even — at the difference in the ways the different distributors treated the concept of intellectual property. The first contact I had with the world of these distributors went quite well. I received a very nice letter from the people at Budgetbytes. The letter asked my permission to redistribute *TILT!* on the company's disks. I was unfamiliar with Budgetbytes and so gave the staff a call.

I asked them to mail me a copy of their latest catalog so I could show it to my co-author and said we would get back to them with our decision. They were extremely cordial and friendly. I received the catalog the next week.

It's a nicely done catalog with an explanation of what shareware is and a plea to support shareware authors on every page. Mike and I agreed that it made sense to "go for it" and we did.

Then, in the next weeks, we began to see *TILT!* screens appear in various ads from different "disk houses" in magazines. With the exception of Budgetbytes, not one of these disk houses called to ask our permission to feature or to offer our program.

Yes, our program is shareware. And, yes, I do give permission in the documentation to distribute the program in a noncommercial manner. What is a commercial manner, though?

I think that Budgetbytes, which charges $3.50 a disk, is pretty much noncommercial. That's even cheaper than the price I pay if I go into a store and buy blank disks in quantities of ten.

On the other hand, what about these other disk distributors? One, The Public Domain Exchange, sells disks of software at $9 each. At that price point, I do not consider it to be noncommercial distribution. Here's the beginning of a letter I received from The Public Domain Exchange:

"Dear software author,

Your software creations are included in The Public Domain Exchange (PDE) library. Enclosed is the PDE write-up that features your software product. We're contacting you in an effort to get to know you better and

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inform you about what we do. After reading this letter and the write-up, feel free to write to us if you have any questions or suggestions, or if you just want to chat. . . ."

So, sounds fine at first glance. Notice, however, that this is far from a letter asking my permission to distribute *TILT!* Instead it is a letter stating a *fait accompli.*

The company is distributing *TILT!,* and it doesn't feel that it had to ask my permission first. It has *my* ball, and now it's going to play with it, thank you very much.

On the other hand, even this rather weasling letter is preferable to the treatment we received from every other disk house distributing *TILT!* Not one of the others ever called, wrote, or contacted us in any way to ask if they could distribute our product.

AND THE SEASONS GO ROUND

To this date, we have not received even one shareware fee from anyone who has received *TILT!* through any of the aforementioned sources. It seems that the disk houses make themselves a pretty good pile of money and the shareware author, at least in this case, gets *bupkis* and not even the courtesy of being asked if we like what's happening to us.

As an author I would say that if a user cannot get *TILT!* from a local BBS, or from a computer network, or from a local user group or a national user group such as BMUG, then Budgetbytes at least cut me a deal I can live with. It asked courteously, and I said yes.

No one else even asked me. My intellectual property was taken from me, ripped away without my even having a chance to dodge.

In this case there are three losers and lots of winners. The losers are me and my co-author and also the end-users who probably will not get the sequel to *TILT!* that we once planned. The only winners are the disk houses who never learned how to say "please."

TIMES ARE CHANGING

Still in the realm of shareware but moving to generalities now, there is a brand new problem. It will get more widespread as more and more people are producing shareware with *HyperCard.* It's the problem of shareware being modified and then redistributed.

In other words, person A writes a shareware stack or program. Person B makes some changes to that stack or program. Person B then decides that the modification is so fine that it should be shared with all and begins to distribute the modified stack or program.

Is this wrong?

Most shareware states that it is OK to distribute the program as long as the distribution is done noncommercially and the program, documentation, and shareware plea are all distributed in full.

Problem: When you change a stack or a program, it is possible simply to add changes without cutting or condensing the core program in any way. So when the modified version is distributed, if you split legal hairs, it seems to me that a good case could be made that the original rights granted have been followed. After all, the program has, indeed, been distributed in full along with the supporting docs and pleas.

But there is another problem too — the problem of software subjectivity. One man's meat is another's poison — one person's modification could seem great to them but really make the shareware program less usable or attractive to the customer.

I think that modifying shareware programs is unethical without the author's expressed approval of your modification. I recommend to all shareware authors that they begin to include wording similar to ". . . distribution of this program and documentation in an unchanged manner. . . ." in their grantings of rights.

All in all, the issues of intellectual property are both profound and prolific. Next month I'll move along in this discussion to examine various situations, including how companies such as Parker Brothers "protect" things such as the Monopoly game from unauthorized programmers.

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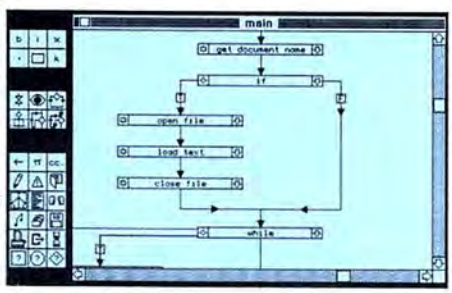
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Letters

We're always happy to hear from our readers, so keep sending your comments on issues of interest to the Macintosh community to Letters to the Editor, MacUser, *950 Tower Lane, 18th floor, Foster City, CA 94404. All letters become the property of* MacUser, *and we reserve the right to edit any letters we print.*

SCREEN GEMS

In your March '88 review of *Business Class* and *Focal Point,* the review praised the screen designs, yet the artist for the product, David Smith, was not given sufficient credit. I believe that there is a special 80/20 relationship in *HyperCard* stack design that stack developers should be aware of. While a prospective user's desire to adopt a stack is based 80 percent on functionality and 20 percent on aesthetics, subconsciously the perceived value of the stack is 80 percent dependent upon aesthetics.

Good Macintosh screen artists are very difficult to find. That makes it even more important to credit the contributions such artists make to quality stack design.

DANNY GOODMAN
AUTHOR, *BUSINESS CLASS* AND *FOCAL POINT*

BEATING THE SYSTEM

Your March '88 review of Apple's *System Update* 5.0 failed to point out one teeny-tiny fact that Apple also didn't see fit to divulge: in addition to the minimum required equipment that is stated on the box, you *also* need two 800K drives or one 800K drive and a hard disk. If you're not blessed with one of these two combinations, you're doomed, as I was, to over one solid hour of heavy disk swapping.

Also, most dealers don't seem to have any idea what you're talking about when you ask for the *System*



Update package. Ask for *MultiFinder* instead.

T.W. REES
SEATTLE, WA

REACH OUT AND WRITE SOMEONE

How dare you, and Dan Cochran in particular, mention a shareware item without an address and a price? God forgive me for not having a modem so I can download everything in the world. Where I currently live, I can't even have a phone.

I refer to a shareware cdev by Riccordo Ettore for changing your beep sound, mentioned in the February '88 *MacUser.*

PATRICK H. JESUI
FAISON, NC

Shame on us. IBeep2 *is one of four programs in the* Sound Manager Package *available from Budgetbytes. You can write to P.O. Box 2248, Topeka, KS 66601. Those with phones can call (800) 356-3551. The order number is D1085, and the price is $6.50 plus shipping and handling. No one should be deprived of the opportunity to have John Cleese shout "Spam!" at them — which* IBeep2 *lets your Mac do — simply on the basis of their access to a telephone.* — VJ

WHOSE PETARD IS IT ANYWAY?

I would like to compliment Robert Wiggins on the article "All Systems Go" in your March '88 issue. I was especially interested in the description of the modular Control Panel and the accompanying screen dump on page 136. I must say that it is nice for an amateur Macintosh developer to see one of his works used by others. Apparently Mr. Wiggins likes my *ApFont* cdev enough to show its icon in his article. *ApFont* is distributed as shareware, which gives users the opportunity to try software before deciding to purchase and use it. My concern is that Mr. Wiggins is not among my list of users who have paid for *ApFont.*

JIM HAMILTON
AUSTIN, TX

Your point is well taken. The only way that shareware can remain a viable alternative to normal distribution (with the higher prices that entails) is if people are honest. Shareware isn't free software, it is "try before you buy" software. If the software offers value and is used, it should be paid for. If not, it should be passed along to others for evaluation, and then be erased. My apologies for not following my own advice. I tried Apfont *and find it of little value and have never used it, and therefore will erase it from my disk immediately. I urge everyone reading this to do likewise; if you have shareware programs on your disks, either pay for them or erase them.* — ROBERT R. WIGGINS

BELINDA MORRISSEY

Letters

SHARED THOUGHTS

I'm dismayed at the casual dismissal of shareware as "a lousy idea" in Doug Clapp's March '88 column. He states that "If it's good, if it has value, you'll find a publisher." This just is not true. There are many excellent software products that would not exist if the authors had given up after being rejected by the publishing community. Most shareware authors (myself included) can't afford to become a "bona fide publisher" if that means quitting their only means of making a living and sinking a small fortune (which I don't have) into slick packaging.

It is true that anyone can call their software *shareware* and put it on BBSs. Much of this software is of poor quality and gives shareware a bad name. This is one of the issues we at the Association of Shareware Professionals (ASP) are trying to address. The ASP is a non-profit organization made up of shareware authors nationwide who desire to see recognized standards established for shareware programs and companies. Members agree to follow the ASP's code of ethics and to adhere to the ASP's standards for software and documentation. These standards weed out the poor quality shareware and demonstrate that shareware is a viable alternative to commercial software. Contact the ASP at 325 118th Avenue SE, Suite 200, Bellevue, WA 98005-3539.

FRANK A. BELL
WAYLAND, MA

WYSIWYG WISEGUY

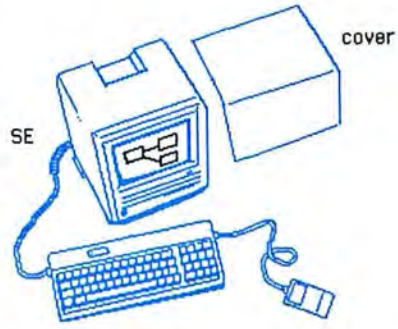
While working on an assignment in a computer graphics class on a Mac Plus last week, I came across a folder on the desktop entitled WYSIWYG. Thinking this was some student's idea of a joke, I trashed the file. The next day, while reading the February issue of *MacUser*, there were two references to WYSIWYG. It appears that this file is used with some program and probably should not have been discarded. What is this folder, and where and how is it used?

RUBIN SAXNER
HOMEWOOD, IL

Whoa! Do you always destroy everything you don't recognize? (No wonder aliens stopped visiting our planet.) In any shared-Mac environment, a cardinal rule should always be, "don't mess with what you know isn't yours, especially if you don't know what it is." WYSIWYG stands for What You See Is What You Get. In a WYSIWYG program, the screen display matches what gets printed out (more or less). That folder probably contained somebody's irreplaceable page layout documents or applications. — JZ

GLARING OMISSION

The cheapest screen filter you can buy is a simple see-through vinyl blue report cover. C-Line is the brand I use (at about 30 cents apiece). I have one hanging on each of our four Macs here at the Blood Center of Central Iowa. I discovered it by mistake one day when I was using a report cover and set it on top of my SE. The cover flopped down over the screen, and the rest is history. If you have a 512K or Plus machine, you can trim the cover so that it does not inhibit the air flow to the Mac. These report covers seem to carry just enough of a static charge to make them stick to the Mac like magic. I have not tried the red, green, yellow, or smoke-colored covers, but I can say that blue is definitely easy on the old peepers.



GREG OVERTON
DES MOINES, IA

THE 400 CLUB

I have an archaic 400K drive, and I'm a little ticked off at a software company that claimed its software would run on my system but failed to mention how cumbersome it would be. (No need to name names; they aren't the only guilty ones.) I'm not complaining about the lack of software for those of us who are willing to limp along with old ROMs and 512K Macs. What I am complaining about is that companies advertise or suggest that their software runs on my system when, in reality, I have to swap disks constantly to run the program and have little space left on my disks for the files associated with the program. It's like being told that the WonderLux vacuum cleaner with a 50-horsepower engine will clean any mess — without mentioning the fact that it has a 2-foot cord that you have to constantly unplug and plug into different outlets in your house, and that your house may not have enough plugs to do the job right.

DAVID C. ERGO
SANTA ROSA, CA

Truth in advertising might be a contradiction in terms, but we can always hope. Honest labeling — like "Works, but annoying without a hard drive," "A royal nuisance with less than a 4-megabyte Mac II," or "Runnable, but unbearable, on a Mac 512K" — might put some companies out of business. You could always get an extension cord for your WonderLux. — BT

TOY SOLDIERS OF FORTUNE

I was really shocked when I received the February '88 issue of *MacUser*. Wow! There on pages 240 and 241were photos of my favorite hobby, collecting toy soldiers. I was in tears at the sight of these toy soldiers, because they're the reason that I got involved with the Mac. I use my Mac to put out a newsletter on collecting toy soldiers. I had no idea that anyone in the computer world or in the computer publishing business knew of their existence. If there are any more *MacUser* toy soldier collectors out there, I sure would like to know about them. They can write to me at 92 Swain Avenue, Meriden, CT 06450.

HANK ANTON
MERIDEN, CT

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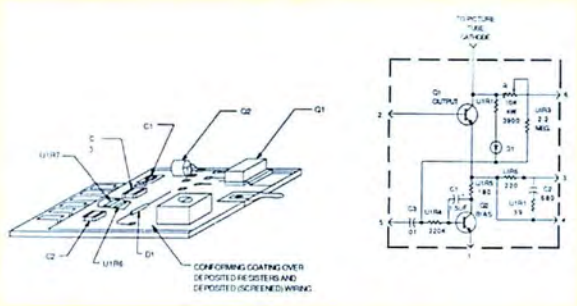
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Art by Sharon Steuer

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Create a Masterpiece —Layer by Layer

Only "Draw It Again, Sam" lets you create and use up to ten transparent drawing planes. You can group similar objects together, as an architectural blueprint or an anatomical drawing. Peel them away to reveal layer after layer of detail. Or view them all while working on only one — and avoid those accidental mouse-clicks that make doing detailed drawings such a trial. Use layers in conjunction with colors to produce spot color separations with ease or extend a single drawing into an animated series. You can even import a drawing and work over it or behind it without touching the original. Save or print the drawing layer-by-layer or as a whole. The possibilities are endless!

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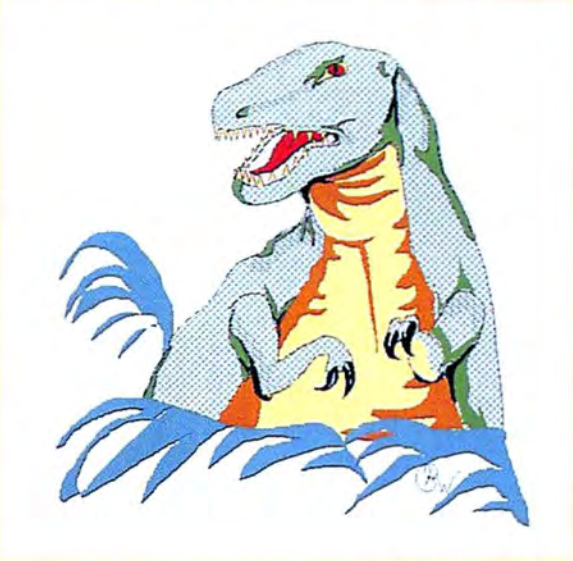
"Draw It Again, Sam" uses the Macintosh's drawing modes to their fullest potential. Your objects can be in opaque, inverted, clear, or erased modes. You can experiment with overlaying transparent colors and patterns, you can even extend your drawing skills beyond the basics and generate an endless set of special effects. The countless colors and shapes achieved by this program are breathtaking.

To Paint or Not to Paint

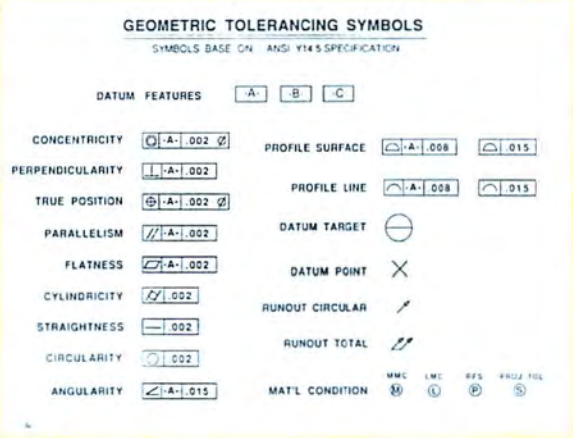
Version 2.0 of "Draw It Again, Sam" adds a full set of painting tools to the drawing ones. Now you can combine the fine detail of bit-mapped graphics with the flexibility and ease of object-oriented drawing. And you can use both paint and drawing tools on the same layer — either side by side or overlapping. The best part is, "Draw It Again, Sam" is compatible with other paint, draw and page layout programs, allowing you to import and export art forms.



Layers - Libraries - Paint & Draw



Art by Patricia Woodruff



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Letters

chagrined, incensed, and 25 bucks poorer. You see, the "Bug o' the Month" in the March '88 *MacUser* was reported to *MacUser* by me a year ago.

Oh, I know that it will probably turn out that you've been "Bugsy" for only the last two months and the former Bugsy is no longer with the firm or some such — that's how such things always turn out — but nonetheless, had *MacUser* run it a year ago, perhaps Mr. Morley Chalmers of Don Mills, Ontario mightn't have lost his valuable data and learned about this bug the hard way. When you have a slow month for bugs (OK, not likely, but what if?), do you dredge up some of the cast-off bug reports and rummage through them for a Bug of the Month? Just curious.

I coulda been somebody. I coulda been a contender!

WARREN P. MICHELSEN
PAGE, AZ

Warren, you are *somebody to us. When we got your bug, we could tell you were meant for bigger and better things, like the "Letters" column (no disrespect intended for Mr. Morley Chalmers). Yes, bugs stay in the running for possible future use in a slow month. Our dedicated staff of bug archivists keep up-to-the-minute records of the current standings of each month's leading contenders for this great and lucrative honor. But just what do you mean by the "former" Bugsy? You probably think there were multiple Lassies, too.* — Bugsy VIII

MARGINALIA

Daniel Rosenbaum's explanation of the *Word* ruler bar (on page 144 in the March '88 issue) illustrates a fundamental block to the understanding of *Word*. Specifically, the small black rectangles at the ends of the ruler bar do *not* control the margins of the paragraph — in fact, paragraphs do not even have margins, *pages* do. The small black triangles control the amount of indentation a paragraph has from or relative to the margins of the page.

In my client training, it has become a basic requirement that the user truly understand how *Word* thinks about a document, including characters, paragraphs, sections, and pages, and what formatting attributes are associated with each and how they affect each other. *Word* thinks about a document differently from every other word processing application and, as a result, is a true powerhouse product.

DAVID C. GINGRICH
INDIANAPOLIS, IN

Being misunderstood has always been the price of individuality. But the difficulty people have in simply talking about Word *shows up some of the problems with the interface. If the ruler had a more intuitive design, there might be a more obvious name for the margin-control symbols than "the small black triangles at the ends of the ruler bar."* — JZ

ON YOUR MARK

Congratulations on being the first magazine to give *Ready, Set, Go!* the recognition it deserves. I've logged over a thousand hours on the program and have found it astonishing that people believe *PageMaker* is better.

Please let me add a couple of points to those of your reviewer. Placing captions next to graphics that are designated "run-around" is simple: Call up the Specifications for the caption text box and click "Ignore Run-Arounds." Also, you *can* view reverse type on the screen — if you fill the text block *itself* instead of putting a filled rectangle on top of it. To update two entries on *RSG!* in your "Miss ng Piec s" section, Version 4.0 *does* have a scroll hand, and it also has text stretching, as the manual explains. Simply write your text in a text block, cut the text block, and paste it into a picture block (which can be scaled horizontally and vertically).

JON MARKEN
HAMPDEN-SYDNEY, VA

STAR SEARCH

I've had a DA called *Stars* 1.3 for about two years. When selected, it blacks out the screen and creates the image of moving through space, with stars whizzing past you. I believe it is a superior screen saver to *Pyro!*, because

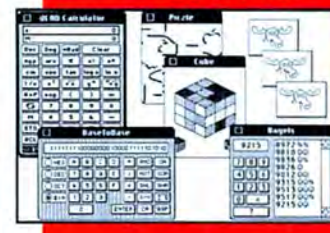
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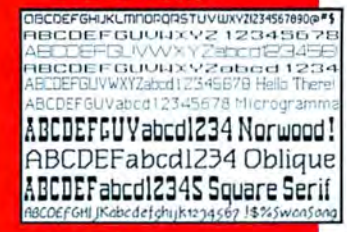
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250 DAs



225 Fonts



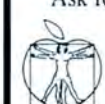
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Letters

the image in *Stars* is more evenly random than *Pyro!*, as it creates its images on all parts of the screen and is the most aesthetically pleasing screen saver I've ever seen. Its drawback is that it is not as easy to use — for instance, it doesn't "time-on" automatically.

I would like to know who developed it so I can pay the shareware price for it (if there is one) and find out if it has been improved.

LARRY SCOTT HASTINGS
AUSTIN, TX

Contact Larry c/o MacUser *if you know from whence* Stars *came. We've also heard good things about* MacsBug, *a screen saver from Itty Bitty Computers of San Jose, CA. — JZ*



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SPEAKING IN TONGUES

In Linda Custer's March '88 article on *QUED/M*, her analogy — calling text format the Esperanto of the computer world — is accurate in one respect, and inaccurate in another. As the one million people who speak it can testify, Esperanto is indeed a great communications tool between otherwise isolated language groups. It's several times easier to learn than any other language (just like the Mac) and politically neutral.

However, Ms. Custer's analogy implies that Esperanto is somehow boring, plain, or missing the linguistic equivalent of "diagrams" and "graphics." Not so! Esperanto is every bit as powerful as *Word*, as capable as *QUED/M*, and as handy as *Suitcase*. Several thousand books exist in Esperanto, some translations of great works of various cultures and some original. Esperanto is also used in poetry, day-to-day correspondence, radio broadcasts, e-mail (check FLEFO, the Foreign Language Education Forum on CompuServe), and even for swearing.

The Esperanto League for North America will send free information to anyone who asks. Write to: ELNA, P.O. Box 1129, El Cerrito, CA 94530.

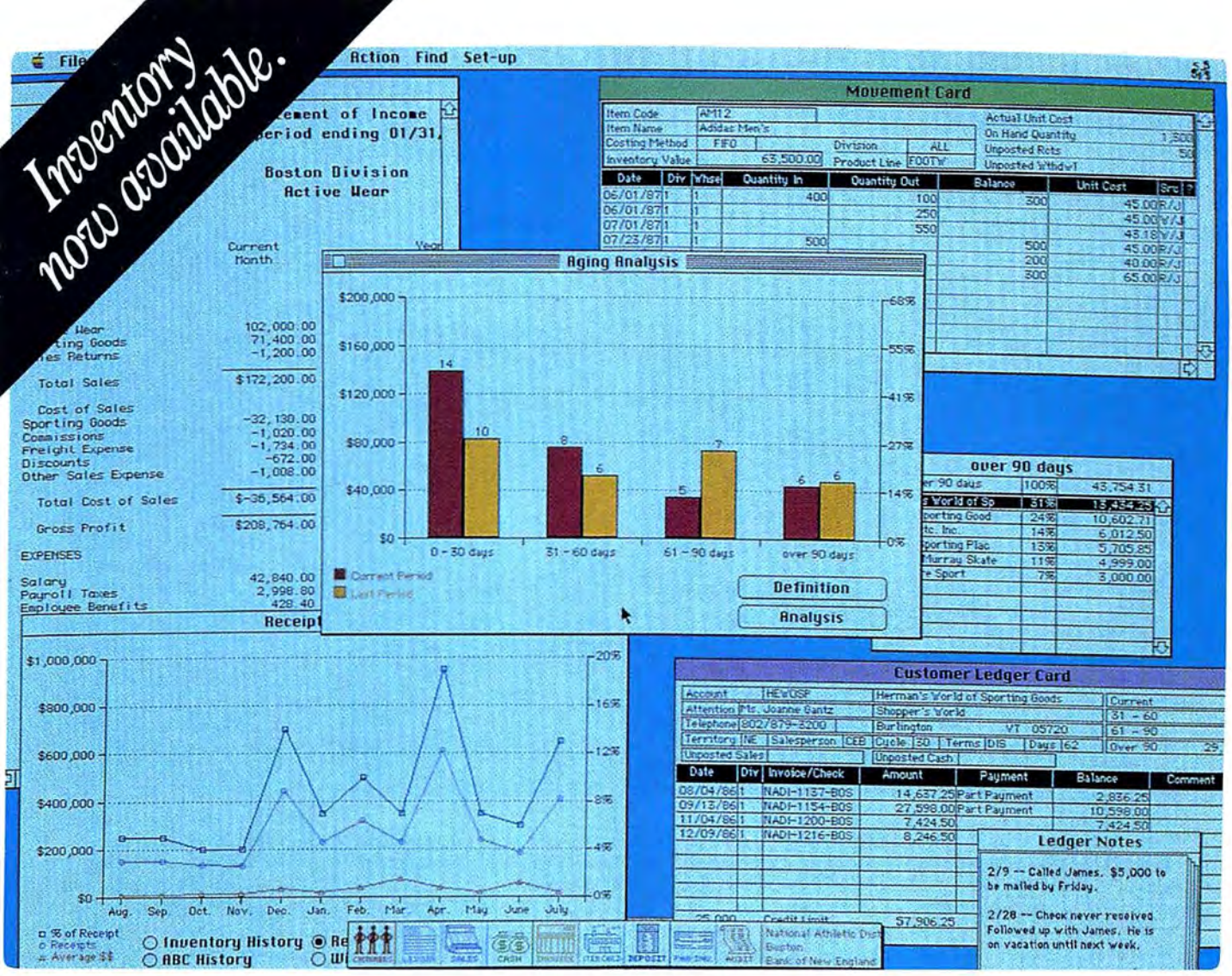
DAVID WOLFF
ACTON, MA

ONE NICE STAND

One *can* beat the $19.95 price of the McWedge Mac stand (see "New on the Menu," April '88). I use a thick book to elevate the front of my Mac to just the right angle. This particular book only cost 50¢ at a bookstore sale. Besides, one can read the book when not using it to prop up one's Mac.

JACK B. FRIEND
SALT LAKE CITY, UT

Jack be nimble, Jack be friend —
Jack looked over a means to that end;
Jack B friend, Jack B quick;
A spare MacUser *might do the trick.*
Jack B. Friend and Johnny B. Goode
Subscribe to MacUser —
you really should. — JZ



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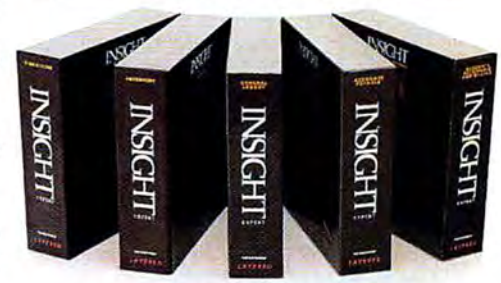
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EDITED BY JON ZILBER

Seybold Retold

Macintosh connectivity broke new ground at the Seybold Seminars '88 in San Francisco in March, particularly with Mac links to Scitex high-end color prepress systems. The most widely discussed announcement at the show was a joint effort between Scitex and Quark, publisher of *XPress* page layout software. The two companies are developing a new version of *XPress* that will incorporate the Scitex HANDSHAKE data format. The new version of *XPress* will bring Scitex power to a personal computer for the first time.

While forging a Mac alliance via Quark, Scitex was also taking sides on the opposite side of the fence from Apple with another announcement, this one with Adobe, regarding plans to develop PostScript and Display PostScript for Scitex systems. Apple currently uses separate page description software for screen display and printer output (its own QuickDraw and Adobe's PostScript, respectively), while other computer companies — notably DEC, and Steve Jobs' NeXT — have expressed interest in using PostScript for both tasks. For more information, contact Scitex at Eight Oak Park Drive, Bedford, MA 01730; (617) 275-5150.

Lightspeed also announced its *Prepress Link*, which connects its Mac II-based Color Layout System with color prepress systems from Scitex and Hell Graphic Systems. The transferred page layout retains all page geometry information, color instructions (for tints and color values), linework (including display text, body copy, and logotypes), and low-resolution continuous tone images (for positioning). Lightspeed can be reached at 47 Farnsworth Street, Boston, MA 02210; (617) 338-2173.

One of the most stunning demonstrations on the exhibition floor was a technology for enhancing PostScript halftone image output from Rise Technology. The technology increases the LaserWriter's resolution from a 50-dot screen to a near-photographic quality 150-line screen. Rise describes the output generated using its technology (now being offered to laser printer manufacturers and resellers) as "magazine-quality photoprinting" from a laser printer. Contact Rise at One Kendall Square, Cambridge, MA 02139; (617) 491-6601.



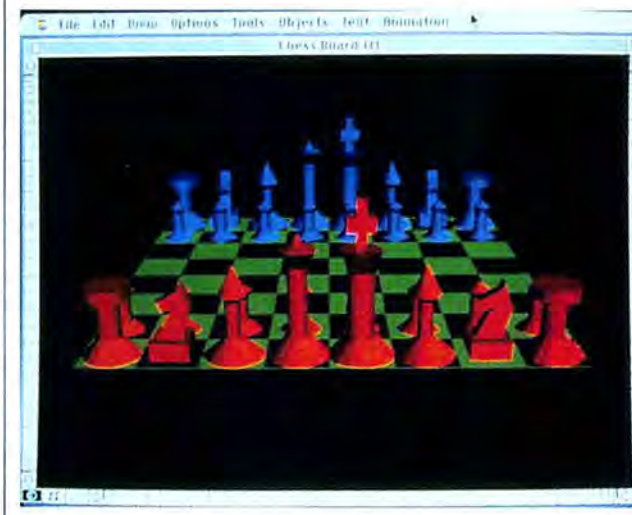
Rise Technology's technology for enhancing laser printer output produces near-photographic quality halftones. The same TIFF file is shown printed with (right) and without (left) the Rise enhancement.

SoftQuad took advantage of the show to launch *Author/Editor*, a non-WYSIWYG text processor designed to conform with the Standard General Markup Language (SGML) widely used by typesetting hardware. SGML may seem antithetical to the goals of desktop publishing. But by separating form and content, it simplifies the job of creating large text documents and interfacing them with typesetting equipment. *Author/Editor* is designed for all Mac configurations, including *A/UX* running on the Mac II, and lists for $495. SoftQuad can be reached at 720 Spadina Avenue, Toronto, Canada M5S 2T9; (416) 963-8337.

Abaton announced plans for putting its scanner software in a Control Panel utility called *PanelScan*. With *PanelScan*, you can initiate and control scanning while working within a desktop publishing application, a real boon for those with insufficient memory to run *MultiFinder*. Abaton was also touting its forthcoming *C-Scan Plus* image processing software and FAX Modem hardware. Abaton is located at 48431 Milmont Drive, Fremont, CA 94538; (415) 683-2226.

If two dimensions leave you flat, you'll be interested in Silicon Beach Software's *Super 3D*, which should be available by the time you read this. *Super 3D* takes two-dimensional graphics objects and transforms them into three-dimensional solids by graphically extruding or revolving them. You can specify the number of facets for each object and display them in wire-frame or solid view. Once objects are created, you can spin, translate, and rotate them, specify up to four independent light sources, and zoom in and pan over the scene. A 16,000-color version for the Mac II — *Super 3D Enhanced* — will take advantage of the 68881 math coprocessor to speed things up. It's due out by the end of summer. If your graphics lack depth, contact Silicon Beach at 9770 Carroll Center Road, Suite J, PO Box 261430, San Diego, CA 92126; (619) 695-6956.

— Jon Zilber



***Super 3D* from Silicon Beach adds a new dimension to your graphics. It turns flat images into solid models with a quick rotation or extrusion.**



The Dumples are coming! The Dumples are coming! But — that's funny — they don't *look* dumplish. Now you can change the look, feel, and strategy of each *Crystal Quest* cast member.



Dang! Design a different Dumple daily with the new critter and sound editor for *Crystal Quest*.

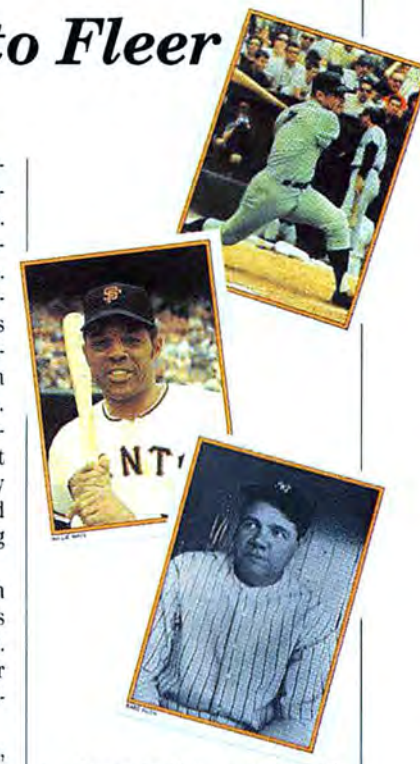
Sound and Fury

The folks at Greene, Inc. know they have a hit in *Crystal Quest*, their manic-paced game reviewed in our April '88 issue. But they and the programmer decided to improve it anyway. What they've come up with is a sound and "critter" editor that lets you customize the game's characters and their strategies. You can set things up so that nothing shoots at you, lots of high bonus point crystals appear on every wave, and Dumples can be killed with one shot (the current default is two, and it usually takes more). You can also import any digitized sounds you like into the game and redesign all the bad guys. One personalized version of the game we've seen shouts, "Yabba dabba doo!" every time you set off a smart bomb.

If you can't leave well enough alone, look for the editor in your local software store, or get in touch with Greene, Inc. at 15 Via Chualar, Monterey, CA 93940; (408) 375-0910. Bosses, take note: Your employees' copies of *Crystal Quest* would be greatly improved by the addition of your digitized voice saying, "Get to work" every time they try to take an innocent break.

— *Louise Kohl*

Donruss to Fleer to Topps



If those names don't mean anything to you, you don't know baseball — or at least, baseball cards. And if there's one thing Compu-Quote knows, it's baseball cards. The company has added disks covering the Donruss and Fleer lines to its *CARD/FAX* package that already provides collectors with data on cards published by Topps.

Using these databases, collectors can keep up with current market values, what cards they need to complete their sets, and how much they should be paying for the missing goodies.

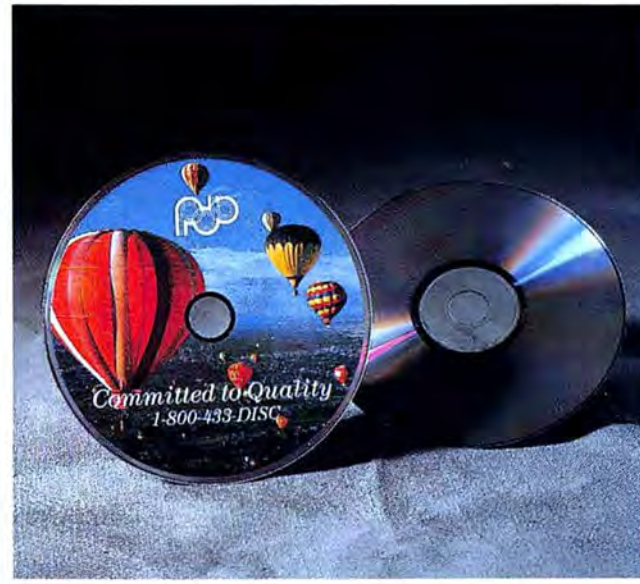
Collectors who already own *CARD/FAX* can add the Donruss and Fleer versions for $45 each. New buyers will pay $95 for their first package, and $45 for each additional database.

To keep all this info current, Compu-Quote also offers an Annual Market Price update disk each May, for $25. The updated information can be merged with the appropriate *CARD/FAX* set automatically.

Cautious collectors, who like to scout their cards first, can check out Compu-Quote's *Preview Pack*, a demonstration version of *CARD/FAX* that sells for $15.

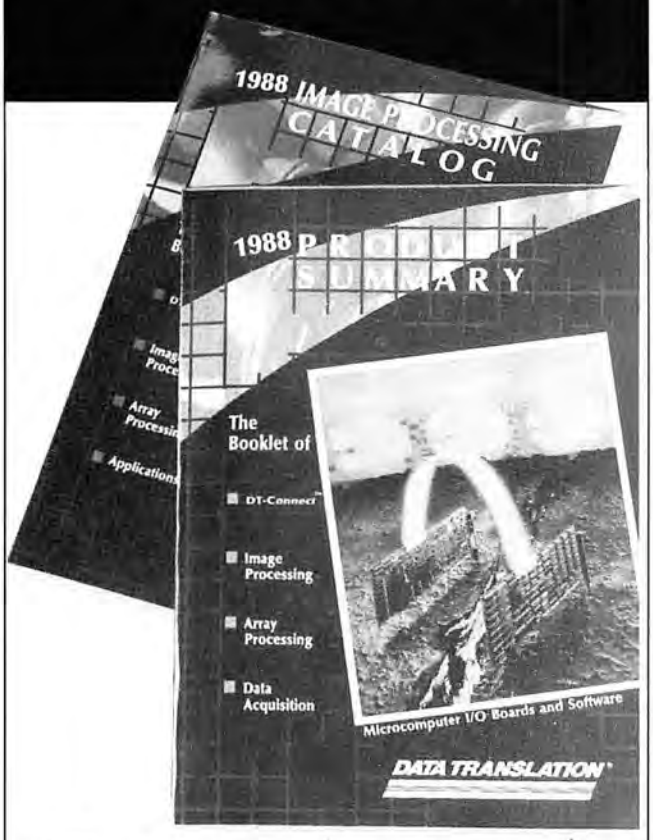
To get the season started, contact Compu-Quote at 6914 Berquist Avenue, Canoga Park, CA 91307; (818) 348-3662; or to order, call (800) 782-6775. So, what'll ya give me for an '87 Mark McGuire?

— *Russell Ito*



Apple wasn't the only company to make a colorful splash at the Microsoft CD-ROM show in March. Discovery Systems and Philips and DuPont Optical were showing off picture discs printed with four-color labels and imprints. What's next — CD-ROM discs on the backs of cereal boxes?

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NEWS LINE!

How Much Is That Suit in the Window?

SAN JOSE, CA — The look and feel of the Macintosh interface is at the heart of a lawsuit brought by **Apple Computer** against **Hewlett-Packard** and **Microsoft.** Apple charges that the combination of H-P's *New Wave* software running under Microsoft's *Windows* violates Apple copyrights. Apple's suit asks that *Windows* 2.03 and *New Wave* be withdrawn from the market and that Apple be awarded unspecified damages. Apple had licensed certain aspects of the desktop metaphor to Microsoft for earlier versions of *Windows.* Version 2.03 is the first retail version of the program that features overlapping — instead of tiled — windows. Some industry analysts speculate that the real target of the suit is **IBM**'s forthcoming *OS/2 Presentation Manager* software.

Plus is Less

CUPERTINO, CA — **Apple** has also reduced the list price for the Macintosh Plus, from $2199 to $1799. The price cut adds further fuel to rumors that the Mac Plus will be discontinued, making the SE the entry-level product in the Macintosh series. Apple denies such rumors, maintaining that the price cuts are intended to help the Plus compete in the home and education markets.

Ziff is More

NEW YORK — **Ziff Communications,** owner of several leading computer magazines including ***MacUser,*** has formed a partnership with **Patch Communications.** Ziff will have operating responsibility for Patch's magazines, which include ***MacWeek***, a weekly trade magazine.

Macintosh Institute of Technology

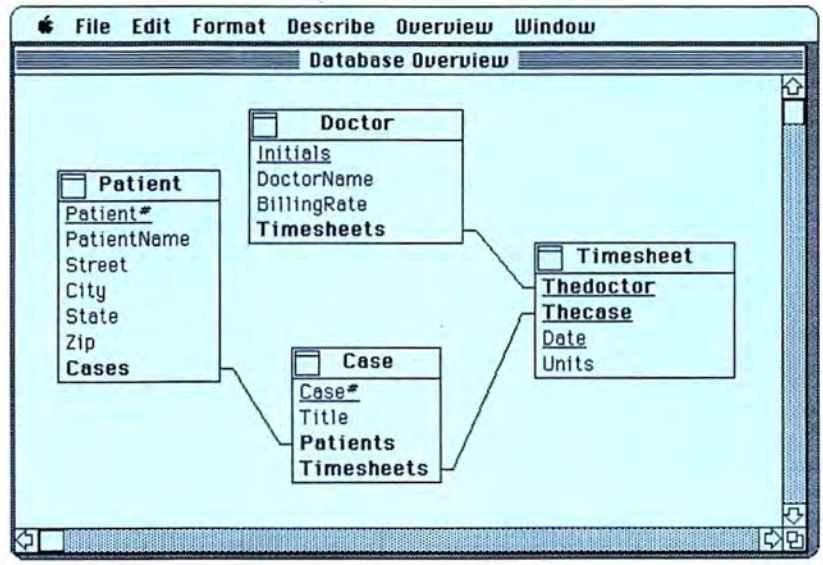
ANAHEIM, CA — The color capabilities of the Mac II are for more than just pretty pictures. Mac-based engineering and CAD/CAM applications on display at the 1988 **National Computer Graphics Association** trade show in March included *Architrion,* a CAD program from **Gimeor** for architects and facilities designers, 2D and 3D design applications (like *VersaCAD* from **Versacad Corp.** and *Design Dimensions* from **Visual Information Systems**), and simulation/analysis programs (like *MSC/pal* from **MacNeal-Schwendler**). Also on display: output devices (including film recorders from **Mirus, Lasergraphics,** and **Matrix**) and software and hardware for desktop fabrication of wax, wood, and metal prototypes.

Thin Bits... Watch for a spate of joint marketing ventures, as companies team up to combine separate products into co-marketed "solutions." **Letraset** and **Data Translation** are co-marketing their *ImageStudio* and Quick Capture frame-grabber board, respectively; Letraset is also teaming with **Pixelogic**'s ProvViz digitizer and **MacroMind**'s *VideoWorks II* software . . . **LaserWare** is co-marketing its *LaserPaint Color II* software with 24-bit boards from **RasterOps** and with **Sharp**'s JZ-450 scanner . . . Hopkinton, Massachusetts-based **Clearpoint Research** has its new MC2RAM Mac II-compatible 1-megabyte SIMM modules in stock at press time.

Reflex Plus can show you more about relationships than Dr. Ruth

The relationships between different pieces of data within your database are all important ones. Because Reflex Plus is truly *relational*, it can "relate" and cross-reference your data.

Many "database managers" are not much more than "list managers"—simple lists that can't connect and cross connect one item with another. So while they can "list," they can't really "manage."



You simply draw connecting lines to relate one item to another.

What your data tells you depends on how you look at it

It's easy to customize your output with Reflex Plus. Whatever you're working on—letters, invoices, quotations or data entry screens—Reflex Plus lets you add graphics, position them wherever you want, change sizes, change fonts and produce truly professional results. Reflex Plus lets you make the most of your Macintosh.

Some of the power pluses of Reflex Plus

- Visual database design—a "natural" for your Macintosh
- WYSIWYG ("What-you-see-is-what-you-get")
- Truly relational database manager
- Auto-Save—which means you'll never lose data again
- Paste Choice command that saves you enormous amounts of time
- Context-sensitive online Help
- Automatic creation of formulas to let you instantly search, sort, calculate, qualify and more
- Multiple entry forms for the same database
- Entry for more than one database in a single entry form
- Shows one record at a time or all records at once
- Calculated fields in entry forms
- Display-only fields
- Default, but editable fields
- GROUPBY function
- Record sizes can be 1000, 2000, or 4000 characters
- Compatible with all Macintoshes with at least 512K RAM including Macintosh SE and II
- New rewritten documentation

*Customer satisfaction is our main concern. If within 60 days of purchase this product does not perform in accordance with our claims, call our customer service department, and we will arrange a refund.

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"Borland's new relational database, Reflex Plus, is the best Macintosh database . . . It is simple to use and operate, very flexible in design, low cost (only $279 compared to $500 for dBase Mac), and small in size (250K versus 730K for Fourth Dimension) . . . We converted an Omnis 3 database that took two weeks to design into Reflex Plus in two days . . . We think Borland is right on target with their approach.

David Smith, MacTutor"

How to succeed in business for only $279

Reflex Plus is the super-power of truly relational databases, and it's only $279 plus shipping and handling.



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Open and Shutter Case



Anyone can get custom-printed diskette labels from the local copy shop. The latest diskette status symbol is customized *shutters* from West Coast Telecom. It's actually more than just a touch of glitz. Whether you sell software or keep company data on company diskettes, shutters with your logo on them helps users organize their diskettes and can be an effective data security measure or software piracy deterrent. West Coast Telecom offers one- or two-color imprinting, and the diskettes can be preformatted to double-sided format. For more information, call (503) 620-1888, or write West Coast Telecom, 10300 S.W. Nimbus Ave., Suite A, Portland, OR 97223.

— Jon Zilber

UPDATES

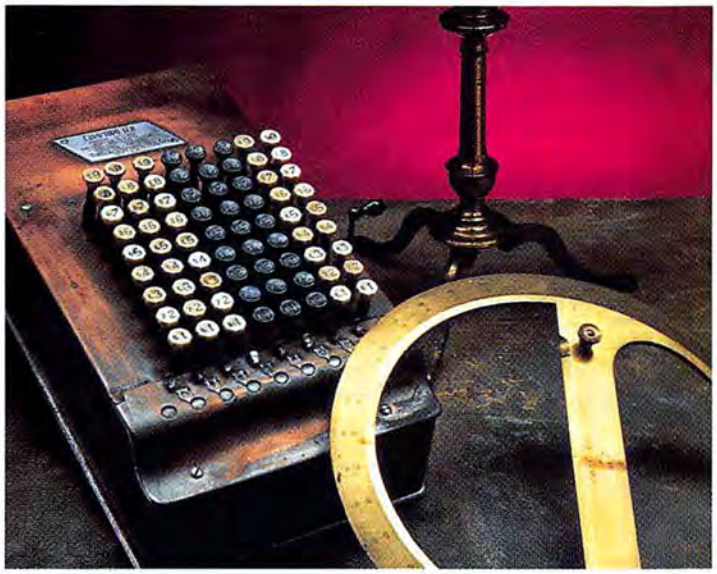
Programs, like wine, often improve with age. To get the most out of your programs, you should be using the most recent versions. Here's a list of the current version numbers (as of press time) of many popular programs. The version number of a program can usually be found by running the program and checking the ABOUT... item at the top of the Apple menu.

Apple *System* software is special. Generally, and unless you have a 128K Mac, you should be running the latest System software. (128K owners should continue to use *System* 2.0 and *Finder* 4.1 and 512K, 512KE, and XL owners should stick with *System* 3.2 and *Finder* 5.3.) The latest Apple *System* software is available free from most user groups, national on-line services and local BBSs. The deluxe version (four disks, boxed and well-documented) can be purchased through Apple dealers for $49.95, not a bad deal considering what's included: *Finder* 6.0, *System* 4.2 or 4.3 and the long-awaited *MultiFinder* 1.0. As information on *MultiFinder* compatibility becomes available, we'll keep you informed.

All programs listed here are HFS compatible. The meanings of the codes in the right column are as follows: CP or NCP, copy protected or not; //, programs we have found to be Mac II compatible (not yet a comprehensive list); and S, shareware (try before you buy software). Changes and new listings are shown in **bold.** Compatibility is sometimes in the mind of the beholder. Programs that are listed as Mac II compatible may not perform 100 percent of the functions they offer on other Macs, nor do they necessarily take full advantage of the Mac II.

A.A.I.S. Prolog	M1.15	NCP	Fokker Triplane	1.0	CP	MacNosy V2	2.8	NCP	Rags to Riches	3.0	CP,//
Acta	2.0	NCP,//	FONTastic Plus	1.4	NCP, //	MacPaint	2.0	NCP,//	Ragtime	1.1	CP,//
AMS General Ledger	2.08	NCP	Font/DA Mover	3.6	NCP	MacPalette	1.0	CP	Read-It!	1.1	NCP,//
AppleShare	1.1	NCP	Fontographer	2.3	CP	MacPascal	2.1	CP	Ready, Set, Go!	4.0	NCP,//
Aztec C	3.4b	NCP,//	Forecast	2.0	NCP,//	MacProject II	1.0	NCP,//	Record Holder	2.1	NCP
Back to Basics	1.03	NCP	Frame Mac	1.1	NCP,//	MacProof	3.0	NCP	REdit	1.2	NCP
Balance of Power	1.03	CP	FreeTerm	2.0	NCP,//	MacSafe	1.08	NCP,//	Red Ryder	10.3	NCP
Bulk Mailer	3.0	NCP,//	FullPaint	1.0	NCP	MacScheme+			Reflex Plus	1.01	NCP,//
Business Filevision	1.1	NCP	Gato	1.42	CP	Toolsmith	1.51	NCP,//	ResEdit	1.1b7	NCP,//
CalendarMaker	3.0	NCP,//	Glue	1.04	NCP	MacServe	2.3	CP,//	Sargon III	1.0	CP
Chart	1.0	CP	GraphicWorks	1.13	NCP	MacSpec	1.3	CP	Scoop	1.01	NCP,//
Chooser	3.2	NCP	Hard Disk 20	1.1	NCP	MacSpin	1.1	CP	SideKick	2.0	NCP
ClickArt Effects	1.01	NCP,//	Hard Disk Utility	2.0	NCP	MacSpool	2.1	NCP	Silicon Press	1.1	NCP
Clipper	1.01	NCP	HD Backup	1.0	NCP,//	MacTerminal	2.2	NCP	Slide Show Magician	1.3	CP
Cognate	1.5	NCP,//	HD SC Setup	1.5	NCP,//	MacTools (MFS/HFS)	7.1	NCP	Smartcom II	3.0A	NCP,//
ColorChart	1.3	NCP	HFS Backup	2.01	NCP	MacWrite	5.0	NCP,//	SmartScrap & The		
Colorizer	1.1	NCP,//	HFS Locator Plus	2.0	NCP	Mac Zap	5.0	NCP,//	Clipper	1.03	NCP,//
ColorMate	2.1	NCP	Illustrator	1.0	CP/NCP,//	MailManager	1.0	CP	SoundCap	4.4	CP
ColorPrint	2.03	NCP	ImageWriter	2.6	NCP	MapMaker	2.0	NCP	Space Edit	2.0	CP,//
Comic Strip Factory	1.6	NCP,//	ImageWriter, AppleTalk	2.6	NCP	MDA	2.0	NCP,//	SpellNow	1.0	NCP
Comic Works	1.0	NCP,//	InBox	2.0	NCP	MDS	2.0	NCP	Spellswell	2.0f	NCP,//
ConcertWare+	4.0	NCP,//	Insight GL	2.0	NCP,//	Measure Test	12.7	CP,S,//	StatView 512+	1.1	NCP
ConcertWare+MIDI	4.0	NCP,//	inTalk	3.0	CP	MenuFonts 2	2.0	NCP,//	StatWorks	1.2	NCP,//
Copy II Mac	7.1	NCP	Jam Session	1.1	CP,//	Megamax C	3.0	NCP	Stella	1.3	CP,//
Copy II HD	7.1	NCP	Jazz	1A	CP	MicroPhone	1.1	NCP,//	Straight Talk	2.08	NCP,//
Cricket Draw	1.1	NCP,//	JustText	1.1	NCP	Micro Planner Plus	5.8b	NCP	Studio Session	1.4	CP
Cricket Graph	1.2	NCP	Laser Author	1.3	NCP,//	MindWrite	1.1	NCP,//	**Suitcase**	1.2.1	NCP,//
Curator	1.04	NCP,//	Laser Prep	5.1	NCP	miniWriter	1.4	NCP,S	SuperGlue	1.03	NCP,//
Deluxe Music Con-			LaserShare	1.0	NCP	MockPackage+	4.3.4	NCP,S	SuperPaint	1.00	NCP,//
struction Set	2.0	CP	LaserSpeed	1.5	NCP,//	MORE	1.1C	NCP,//	Switcher	5.1	NCP
DesignScope	1.14	NCP,//	LaserStatus	2.0	NCP	MPW	2.0b	NCP	System (MFS-128K)	2.0	NCP
Disk Express	1.10	NCP	LaserWriter	5.1	NCP	MS BASIC	3.0	NCP	System (HFS)	4.3	NCP
Disk First Aid	1.0.1	NCP	Layout	1.3	NCP,S	MS BASIC Compiler	3.0	NCP	Telescape Pro VT 100	1.3	NCP
DiskFit	1.4	NCP,//	Legal Billing	1.72	NCP,//	MS Fortran	2.2	NCP	Tempo	1.2	NCP
DiskInfo	1.45	NCP,S	Legal Billing II	2.39	NCP,//	MS Works	1.10	NCP,//	Textures	1/01	NCP,//
Disk Ranger	3.1	NCP	Lightspeed C	2.01	NCP	Multiplan	1.1	NCP,//	ThinkTank 512	1.3	NCP
DiskTop	3.0.2	NCP,//	Lightspeed Pascal	1.0	NCP	MusicWorks	1.1	CP	Thunder!	1.0.1	NCP
Dollars & $ense	4.0	NCP,//	Listen 2.0	2.1	CP,//	myDiskLabeler	2.11	NCP,//	Thunderscan	4.0	NCP
Double Helix II	r40	NCP,//	Lode Runner	1.0	CP	Neon	2.0	NCP	TML Pascal	2.01	NCP
Draw it again, Sam. . .	2.0	NCP,//	Lookup	1.0c	NCP,//	**Omnis III Plus**	3.25	NCP,//	TMON	2.8	NCP
Easy3D	1.01	NCP	Mac3D	2.1	NCP,//	OverVUE	2.1e	NCP,//	Top Desk	3.0	CP
Edit	2.1	NCP	MacASM	1.2	NCP	PackIt III	1.3	NCP,S	TOPS	2.0	NCP,//
Excel	1.06	NCP,//	MacBillboard	4.01	NCP,S	PageMaker	2.0a	NCP	Trapeze	2.0a	NCP,//
ExperCommon Lisp	2.2	NCP	Mac C	5.0	NCP,//	Parameter Manager	1.092	NCP	Turbo Maccountant	2.0	NCP,//
ExperLisp	1.5	NCP,//	MacCalc	1.2	NCP	Performer	2.2	CP	Turbo Pascal	1.1	NCP,//
ExperLogo	1.1	NCP	Mac Disk Catalog II	2.1C	NCP	PictureBase	1.2	NCP	VersaTerm	3.0	NCP
EZ Draft	2.0	NCP,//	MacDraw II	1.0	NCP,//	Plains and Simple	4.1	NCP,//	VersaTerm Pro	2.0	NCP
FastBack	1.02	NCP,//	MacDraft	1.2b	NCP,//	PLP	2.0	NCP,//	VideoWorks II	2.0	NCP,//
File	1.05	NCP	MacFlow	1.02	NCP	**PowerStation**	2.3	NCP,//	VIP	2.2	NCP
Filemaker Plus	2.1	NCP,//	MacFortran (all)	2.3	NCP,//	Professional Composer	2.1	CP	Widgets	3.0	NCP
Finder (MFS-128K)	4.1	NCP	MacGolf	2.0	CP	Profit Stalker II	1.3	NCP	Word	3.01	NCP
Finder (HFS)	6.0	NCP	MacInTalk	1.1	NCP	Project Billing	3.0	NCP,//	Write	1.0	NCP,//
Findswell	1.0b	NCP,//	MacLabeler	2.2	CP	QUED/M	2.04	NCP	WriteNow	1.0	NCP,//
FlashBack	1.6	NCP	MacMoney	3.01	NCP,//	QuicKeys	1.1	NCP,//	XPress	1.1	CP/NCP,//
Flight Simulator	1.0	CP	MacMovies	1.02	NCP	**QuickWord**	2.0	NCP,//	ZBasic	4.0	NCP

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3. Look at the answer
4. You're done

You can then tell Eureka to

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- Plot a graph
- Generate a report, then send the output to your printer, or a text or MacWrite file
- Or all of the above

You can key in:

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- Constraints (like X has to be $<$ or $=$ 2)
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- Online help
- Calculator desk accessory
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- Ability to generate reports complete with plots and lists
- Polynomial finder
- Inequality solutions
- Supports Macintosh II color monitor

Minimum system requirements:
Macintosh with 512K RAM, 128K ROM minimum. One 800K disk drive.

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BORLAND



DataDesk International's handy keyboard templates are designed for use with its MAC-101 extended keyboards.

The Revenge of DOS

Not too long ago, Mac users could be seen pointing and laughing — discreetly, of course — at PC users who dressed their keyboards with plastic or cardboard cut-outs that told them what all the arcane commands were (remember *WordStar?*). Well, if you were among the guilty, brace yourself: The keyboard template is back.

DataDesk International is now offering a set of five erasable templates for their line of Mac extended keyboards and, like their predecessors, these templates fit around the function keys, giving you "on board" crib notes. Each set comes with an erasable marker pen and a template holder and lists for $14.95.

These goodies are available from DataDesk International, 7650 Haskell Avenue, Van Nuys, CA 91406; (800) 826-5398, or in California, (800) 592-9602. Wow, talk about having the last laugh.

— *Russell Ito*

Take This Box and Shut It

Behind every new product, there's a story. Sometimes it's a tale of innovation, of many years of research, of hours of programming late into the night, or of a flash of brilliance. This, however, is not one of those stories. This is a story of marketing moxie.

Bede-Tech's Printer Silencer is designed to stifle the racket of an Imagewriter I or II. It's a foam-lined cardboard box that fits around the printer, with slots for continuous-feed paper and power cords to run in and out. Oh, yes the press release reminds us to point out that the "attractive wood grain finish will blend with most home and office decors."

The price for this low-tech marvel: only $29.95. (But, wait! Hold the foam! If you order by mail, the Printer Silencer comes in a slightly larger shipping box that you can use on another printer, cutting your costs in half.) Contact Bede-Tech at 8327 Clinton Road, Cleveland, OH 44144; (216) 631-1441.

— *Jon Zilber*



When the package from Bede Tech came into our offices, we anxiously tore open the cardboard box, pushed aside the packing foam, and found inside . . . a cardboard box lined with packing foam! It's designed to surround and muffle your ImageWriter. (Printer not included.)

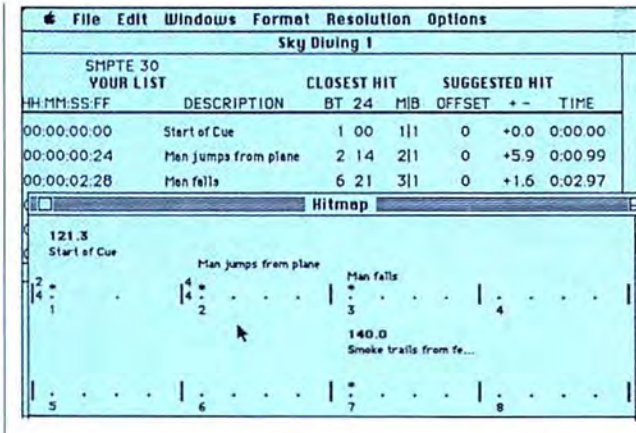
Synch Along with Click

In any good movie, the audio and video tracks are synchronized so seamlessly that you usually don't appreciate how much work is involved. But when something goes wrong, it can become painfully obvious how critical this synchronization is. (Like when the English dubbing of a foreign film doesn't quite match the action on the screen.) Synchronization used to be a complicated proposition, but desktop audio/video production is making it easy to keep your images and sounds in harmony.

Clicktracks (due out by the time you read this) is a new music/video package from Passport Designs for synchronizing MIDI music or sound effect sequences with SMPTE-coded video. MIDI is the standard data format used by most synthesizers, and SMPTE is MIDI's counterpart in the world of video, responsible for keeping track of each film or video frame. *Clicktracks* acts as the go-between, providing a graphic display of where in the musical score video events occur and vice versa.

Clicktracks keeps track of all the timing information while you experiment with changes in tempo and synchronization. And *Clicktracks* can automatically identify the tempo that will provide the best fit between video events and musical beats. Passport also has a new MIDI/SMPTE hardware interface — the MIDI Transport — for controlling all your MIDI and SMPTE gear from your Mac. It has two MIDI in ports, five MIDI out ports, and a built-in variable FSK synchronization signal, and it translates and synchronizes SMPTE signals to MIDI Time Code. The MIDI Transport lists for $459.95, and *Clicktracks* lists for $249.95. For more information, contract Passport at 625 Miramontes Street, Half Moon Bay, CA 94019; (415) 726-0280.

— *Jon Zilber*



Clicktracks lets you call the shots in your desktop audio/video productions, marrying SMPTE and MIDI in perfect harmony.

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#CHM60 $849

CMS MacStack 80
#CHM80 $1369

CMS MacStack 102
#CHM102 $1399

CMS MacStack 140
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Everex EMAC 91D

The EMAC-91 drives provide 90 megabytes of formatted storage in a half-height size, which compliments the Macintosh II, SE or Plus Computer, available through CMO MacCenter. "Stand Alone" systems can take full advantage of the speed (18 milisecond average seek time) and reliability (30,000 hr MTBF) of the EMAC-91 Series Disk Drive. The use of surface mount technology allows the SCSI (small computer systems interface) controller to be included on a single main printed circuit board on the EMAC-91 disk drive.

Everex EMAC 91D
$1499

#EVM20 $559

Everex EMAC 40D
#EVM40 $999

PCPC MacBottom Drives

Proven winners for reliability, speed, and compatibilitiy, MacBottom drives are now available from CMO MacCenter with more memory (up to 45 megs) and built-in 1200-bps modems. All drives include ImageWriter and LaserWriter print spooling, backup, and locater software. In fact, this utility software is among the most advanced and convenient available. PCPC has recognized the needs of power users by adding a 45-meg drive to their line of superior storage devices, with an optional 1200-bps modem available for each model. Still lightweight and portable, these drives pack more power into the same space-efficient footprint. MacBottom gives you everything you need in one neat package!

Personal Computer Peripherals Corp. HD45
#PCHD45 $1149

Personal Computer Peripherals Corp. HD21
#PCHD21 $749

Personal Computer Peripherals Corp. HD32
#PCHD32 $899



CMS Internal Hard Drives

(for II only)

The "PRO-II Series" SCSI hard disk subsystems feature fast data access and include a wide range of storage capacities. The automatic head park feature helps to guard against head crash and data loss. The dynamic brake-lock system helps to protect sensitive areas of the disk during transportation.

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#CHMP43II $699

CMS PRO20-II/i
#CHMP20II $489

CMS PRO43-II/I
#CHMP43II $699

CMS PRO60-II/i
#CHMP60II $779

CMS PRO80-II/i
#CHMP80II $1299

CMS PRO102-II/i
#CHMP102II $1299

CMS PRO140-II/i
#CHMP140II $1799



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Mountain 80MB fixed disk with 20MB Removable Bernoulli
#MB9060 *$3499*

Everex Hard Drives with Tape Backup

Everex EMAC 20/60
#EVM2060 *$1699*

Everex EMAC 40/60
#EVM4060 *$2299*

Everex EMAC 91/60
#EVM9160 *$2599*

Floppy Drives

Cutting Edge 800K External
#EE800 *$189*

Mirror Technologies 800K External
#MH800 *$199*

Central Point 800K External
#CPMAC *$199*



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- Lightest, quietest system on the market
- Average access as fast as 25 ms
- Keep both internal floppy disk drives

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#CHMP20 *$559*

CMS PRO40-SE/r
#CHMP40 *$899*

CMS PRO45-SE/r
#CHMP45 *$829*



Tape Backup

EMAC 60T is 60MByte external cassette tape subsystem for Apple Macintosh—computers.

Everex 60MB External
#EVM60T *$999*

The TS-60/E is one of the fastest tape backup systems available for the Macintosh.

CMS 60MB External
#CHM60T *$799*

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Network Specialties Flat Top Monitor

NEW

Flat-Top from Network Specialties is a new liquid crystal display (LCD) plate and software that allows any standard overhead projector to project a Macintosh screen image.

#NKFT $1499

Dependability.

"Did you know that CMO is one of the oldest direct marketers of computers in the country! We are also one of the largest—serving more than 350,000 customers. Our list of satisfied customers include over 75% of the Fortune 1,000 companies. Also, many schools and universities, as well as many small businesses and individuals have come to depend on CMO for their computer related needs."

Network Specialties BigTop Display

The Network Specialties BigTop gives you a full 20 1/2" flicker-free, multiple-page display. Over 1 million screen pixels (1024x980) and a resolution of 80 dots per inch provide unexcelled screen clarity.

#NK20 $1549

Nuvotech 14" Monitor

Big Screen

For the best all-around performance in this price range. This high-resolution 14" monitor is equipped with tilt and swivel base.

#CX2400 $319

Power R MacLarger 12" Video System

MacFordable

Introducing the MacLarger™ video system from Power R, the first low-cost solution to magnifying and multiplying Macintosh displays.

#PWML $349



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19" Sigma Designs

Introducing the LaserView Display System by Sigma Designs. The absolute highest resolution available (1664x1200) for the Macintosh II. Designed specifically for Desktop Publishing, Desktop Engineering and all management/productivity applications. With the LaserView Display System from CMO MacCenter you now have the tools to create quality documents. Everything from company newsletters to corporate letterhead.

#SF1902 $1849

Network Specialties High Top

Dual screen software, two sizes of menu bars, two sizes of cursors, adjustable screen saver.

#NKHT $1099



PCPC Graphics Display

See the difference... know the reasons.

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#PCCGD01 $4699

Call for other Color Monitors!

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MacMemory Inc. Turbo SE 16 MHz

Most Apple® Macintosh SE power users need to give their SE a performance boost but don't want to spend the thousands of dollars most accelerator boards cost. Now you have an option. CMO MacCenter stocks the Turbo SE—the accelerator board that gives you the speed, compatibility, and reliability you demand but doesn't cost an arm and leg in the process. 16MHz, 6800 accelerator board for the Macintosh SE. Doubles the operating speed of the SE while offering complete compatibility and reliability.

#MKTSE..... *$369*

Maxplus Mega 2MB

#MK04..... *$349*

Maxram/Maxprint

#MK05..... *$39*

Math Coprocessor 68881

#MK06..... *$349*

Multisimms 2MB Set

#MK02..... *$699*



Dove MacSnap 524S

With SCSI Port

MacSnap™ productivity enhancement products from Dove Computer are designed to make you and your Macintosh an unbeatable combination of performance and productivity. Every MacSnap model, whether designed for a 512K, 512E, Macintosh Plus, SE or Macintosh II, offers the same primary benefits—greater productivity and improved system flexibility. All products are fully compatible with Macintosh operating systems and system software. And included with each MacSnap product available through CMO MacCenter is the high performance software, combining a user-configurable RAM disk and Apple's Switcher™. MacSnap, together with its high performance software, can increase your speed by as much as 60% and allow you to manage up to 8 programs simultaneously with only a single disk drive. MacSnap provides access to a greater variety of software and improves your system flexibility and output. And DOVE's advanced product engineering offers "forward compatibility," allowing you to "take the memory with you" as you advance to Apple's new machines.

#DO08 ***$199***

MacSnap Plus 2

#DO03..... *$269*

MacSnap 524

#DO01..... *$155*

MacSnap 548

#DO02..... *$359*

MacSnap 4S

#DO05..... *$929*

MacSnap 2S

#DO06..... *$469*

MacSnap 524E

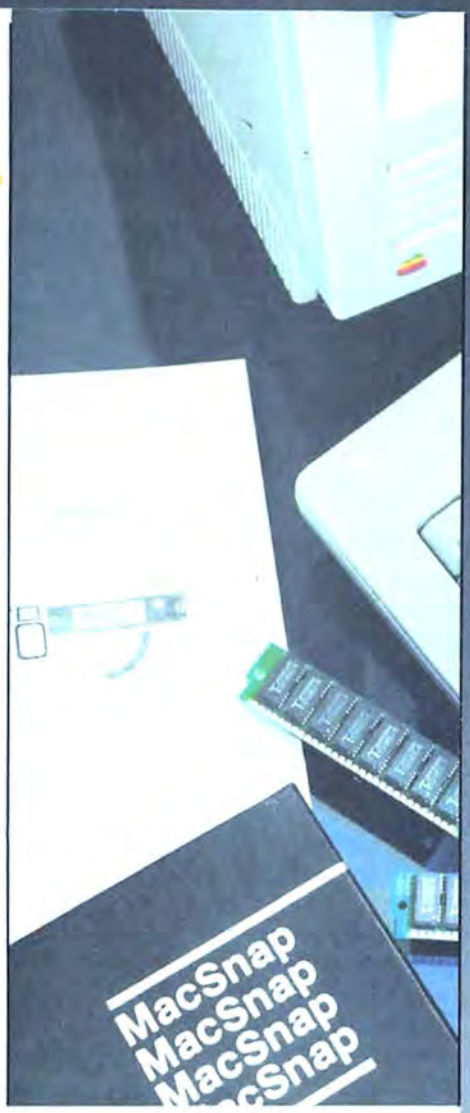
#DO07..... *$149*

MacSnap 548E

#DO10..... *$369*

MacSnap 548S

#DO11..... *$429*



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AST TurboScan

AST TurboScan is the premiere desktop solution for optically scanning and modifying graphic images on your Macintosh. Unlike other text and graphic scanners, AST TurboScan is designed especially for graphic applications, and you can order through CMO MacCenter. Its full-featured graphic editor, SuperScan, gives Macintosh users all of the tools needed for precise scanning and detailed image editing, including numerous paint options, plus fonts, patterns and viewing selections.

You won't have to guess how your final printed output will look.

#ATTS

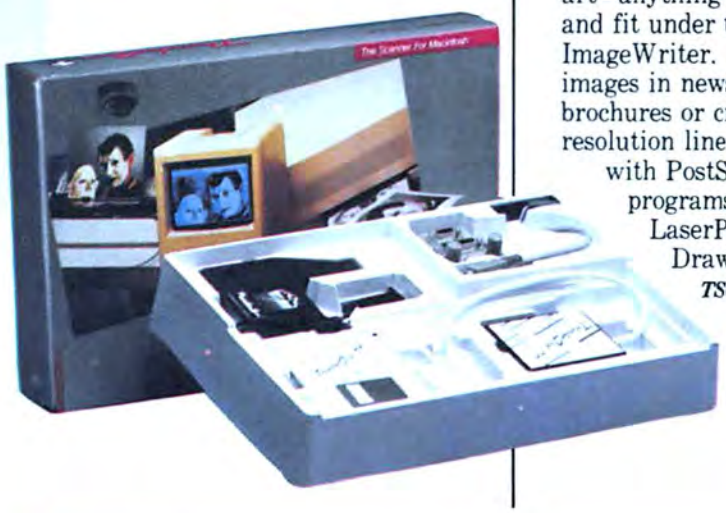
$1399

Hayes 1200 External Modem

With Software And Cable

#HY1200M

$439



Koala MacVision II

MacVision 2.0 is a low cost and easy to use video digitizer system for use with the Apple Macintosh family of computers. MacVision takes standard NTSC composite video signals from a camera, camcorder or VCR and produces a 640 by 480 pixel high resolution digital image with 256 gray shades. The image can be displayed on the computer screen, saved in one of four file formats and printed on PostScript compatible output devices.

#KO01

$199

Thunderware ThunderScan 4.0

With ThunderScan you can create Mac-generated graphics from a photograph, illustrations, or line art—anything you can put on paper and fit under the platen of your ImageWriter. Include high-quality images in newsletters, flyers, and brochures or create your own high-resolution line art by using scans with PostScript drawing programs, such as Illustrator, LaserPaint, and Cricket Draw.

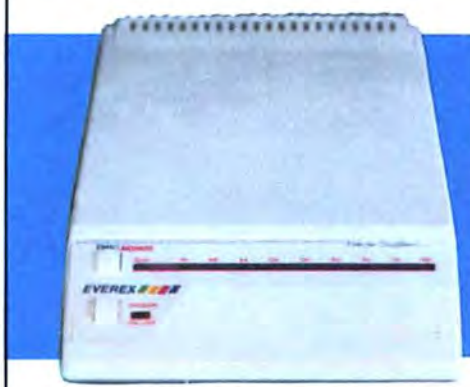
TS01

$199

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The EMAC-MD2400 is fully Hayes® compatible. It works with Smartcom® II and hundreds of other popular communications programs including Red Ryder, AppleLink® and MacTerminal®

#EVM2400

$279



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#MXF2 $18

Sony
DS/DD 3 1/2" Diskettes
#SCMFD2 $18

Kensington System Saver

System Saver Mac's quiet (and we do mean quiet) fan draws a breath of fresh air in through the vents at the bottom of your Mac, across the circuit board, over the power supply, and out the top vent at the rate of 17 cu. ft./min.

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Mouseaway Mousepad
#KEM02 **$9.99**

Tilt/Swivel Stand
#KETS **$21**

Selection.

"Did you know that CMO MacCenter carries over 4,000 products including the best respected names in the industry. Representing over 200 manufacturers, our huge inventory is housed in over 60,000 sq. ft. of space. Because of our large inventory, we are able to provide our customers with tremendous options and selections from which to choose. Also, our trained consultants offer free consultation and will be happy to help design and configure your system to fit your needs and budget."

Kensington Turbo Mouse

Finally, a Mouse that's really quick. One that doesn't require a lot of room on your desk. One that's easy to use, even on a desk full of papers. Turbo Mouse from Kensington. Turbo Mouse turns mouse technology upside down. It puts the mouse ball on top, rather than on the bottom like a standard mouse.

#KETM **$77**



SO WHO NEEDS PROTECTION?

You do...If you own or use a microprocessor, changes in voltage are generally not critical with most electrical equipment. But microprocessor systems do experience equipment damage, memory loss, system "lockups", or other alterations—all from a split second of power variation.



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#CUSPF2 $62

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#CUSP3 $19

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#DZS03 $59

Datashield S-100 Surge Protector
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Software



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Write Now #TM01	$99
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Multiplan MRM05	$129
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Excel 1.06..... $249
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BUG OF THE MONTH

The Case of the Vanishing Text. In this month's episode, Hank Fridell of Custer, SD, discovers that highlighted text in T/Maker's *WriteNow* (v. 1.07) vanishes when the user selects INSERT HEADER, INSERT FOOTER, or INSERT FOOTNOTE from the Format menu — and not even the UNDO command can save him!

MacUser's inspectors jumped on this case and, after careful study, discovered that Hank was right. They rounded up the usual suspects, and under questioning, the Big T claimed that the disappearing act wasn't an accident. "No, no. Youse guys gots it all wrong, see? When ya do dat, Mr. WriteNow tinks ya wanna replace da text wit da Header, Footer, or Footnote marker, see? So, it's s'pposed ta do dat."

Our inspectors were skeptical but, lacking further proof, they let the rascal go. It didn't sound like a very useful feature to them, so they did some digging and found a solution for those quick enough. If you choose UNDO INSERT from the Edit menu — before typing anything in the Header, Footer, or Footnote windows — and de-select the highlighted text — you can safely add the desired insert, without losing anything.

This solution came too late for Hank, but he's been compensated with a check for $25 — the bounty on bugs. The reward could be yours next month. Send the facts of the case to Bugsy, c/o *MacUser,* 950 Tower Lane, 18th floor, Foster City, CA 94404. Be sure you fill us in on your *System* and *Finder* versions, hardware, and any unusual DAs you may have installed. And stay tuned for next month's exciting adventure.

— H.D. Plant

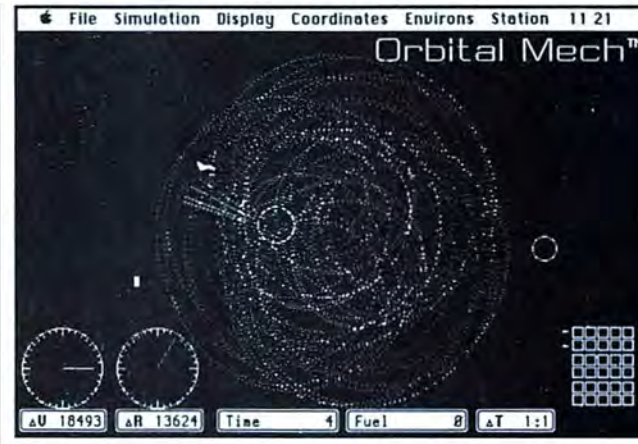
Applications Now Being Accepted

"Why is there no provision for even basic fractions on some part of the keyboard?" asks Dee Forsythe of Rockland, Massachusetts. "Even the wimpiest typewriter keyboard has keys for ¼ and ½ at least. You'd think that with four keyboards available (PLAIN, SHIFT, OPTION, and OPTION-SHIFT), the typeface suppliers could have included common fractions. If that's not possible, how come there isn't a desk accessory that does that? Hacker Alert!"

How come, indeed. There are several fairly high-end programs for creating complex mathematical expressions, but how about an inexpensive DA just for incorporating basic fractions into word processing documents? Wouldn't it be nice if that DA simply asked you for the numerator and denominator and took care of the sub- and super-scripting, made the appropriate changes in point size, and perhaps even generated the PostScript code or bit-mapped artwork to give you a fraction with a real horizontal bar (instead of a slash)? It could even suggest the correct suffix ("-th," "-ths," "-nd," "-nds," etc.), where appropriate, depending on the fraction value.

If you have an idea for an application or DA that you'd like to share with our readers, send it to ANBA, *MacUser,* 950 Tower Lane, 18th floor, Foster City, CA 94404. If we publish it, we'll send you $25. Even better, you just might inspire someone to create just what you need.

— Jon Zilber



Dock, dock. Who's there? *Orbital Mech,* an out-of-this-world flight simulator that reminds us that gravity is not just a good idea — it's the law!

Dock, Dock, Dockin' at Heaven's Door

If your aerospace aspirations go beyond flight simulators, check out *Orbital Mech,* a celestial navigation simulation game and educational program. In *Orbital Mech,* you control a space ship trying to dock with a space station. Your ship and the space station are in different orbits around a heavenly body (or around a binary system).

Orbital Mech is designed to help both sides of your brain feel right at home with the mechanics of gravitation. A variety of screen formats help you get an intuitive feel for maneuvering in space. The spaceship's trail and force vectors can be toggled on and off. And you can view the scene from a variety of coordinate systems — with the action centered about a fixed point in space, either of the masses, or the so-called L_5 libration point where the gravitational and Coriolis forces are at equilibrium.

If you want to get a more qualitative handle on how gravity works, the manual outlines several standard docking strategies, such as the Hohmann Transfer and Spiral Thrust Maneuvers, and works through the mathematics of the behavior of orbiting bodies.

If all of this leaves you feeling marooned, you can always just sit back and gaze at the patterns created by the orbits, sub-orbits, and counter-orbits. (Finally, a lava lamp for the '80s! Or is that MTV?) *Orbital Mech* is available for $49.95 from Studio Zero, 6212 Samuell Blvd., Suite 153, Dallas, TX 75228; (800) 752-9222.

— Jon Zilber

Pledge Break

We'll get back to our regular "New On The Menu" programming in a moment, but first let's take a minute and think about how much value you get out of "New On The Menu" each and every issue. And, yes, friends, that takes money. So go to your phone right now, dial that number, and become a member. If you pledge at the $950 level or higher, we've got a special thank-you gift: a copy of *Institutional Advancement,* a new fund-raising application from ssTs.

Institutional Advancement is based on (and requires) *Omnis 3 Plus.* It keeps track of all the data needed for non-profit and educational fund-raisers and membership drives. In addition to tracking and sorting records for all prospects in various categories (members, alumni, etc.), it automatically sends out pledge cards and reminders and generates thank-you letters.

The single-user version is $950, and the multi-user version is $1900. Call ssTs at (209) 667-9424, or write to 687 Shadowview Court, Turlock, CA 95380.

So what are you waiting for? We need your membership in the "New On The Menu" Entourage (NOTME) to continue providing the quality journalism you know and love. If you don't support us, who will? So don't say "Not me" — say "NOTME!" And now, back to our regularly scheduled programming now in progress.

— Jon Zilber

Do You Know Me?

This face belonged to one of the most powerful men in the world — and he didn't even have an American Express card. If you said, "That's Millard Fillmore!" you're right. If you read that and said, "Who's Millard Fillmore?" you're not alone. (Psst. He was the thirteenth President of the U.S.)

To help get you out of sticky social occasions ("Say, what *did* Millard Fillmore look like?"), and to ease you through this election year, Visatex has two sets of clip art: *U.S. Presidents* and *1988 U.S. Presidential Candidates*. Each disk goes for $35, and the candidates appear in both portrait and caricature. All the images are in paint format, making them compatible with any paint program.



Why isn't this man smiling? Once he was president — but now he's just a *Jeopardy!* category.

Visatex can be reached at 1745 Dell Avenue, Campbell, CA 95008; (408) 866-6596. By the way, Millard Fillmore retired from public life after failing as the presidential candidate for the Know-Nothing Party — truly a man ahead of his time.

— Russell Ito

NORAD or NoRad

Other than their spelling, what do these two organizations have in common? Answer: radiation — one causes it, the other prevents it. At least that's the idea behind the NoRad dB 60, an anti-glare radiation shield for your Mac.

The dB 60's mesh is woven from a composite fiber of conductive metals over a monofilament core that purportedly reduces electromagnetic radiation by 99.99 percent, and its protection is a lot cheaper than NORAD's. It lists for $129.

You can order the dB 60 from NoRad at 1549 11th Street, Suite 205, Santa Monica, CA 90401; (213) 934-2101. And remember, NoRad can protect you from your Mac, but your Mac can't protect you from NORAD.

— Russell Ito



The NoRad dB 60 doing its duty — protecting you from your Mac's radiation.

CLARIFICATIONS

Obfuscations obviated, ambiguities arbitrated, and errors eradicated.

SPEED LIMITS

Thanks to all who wrote with comments and constructive criticisms on our March '88 "MacUser Labs Report" on accelerator boards. A few errors crept into the report. The CPU for the Orion SE accelerator was described incorrectly; it is a 68020-based board. In the Hardware Features chart, the prices for two boards incorrectly included the price of an optional math coprocessor. The price of the Turbo Max (as tested) should have read $1149, and the price listed for the Mac20MX should have been $995. In the Performance Times chart, the zero shown for the Turbo Max was intended to indicate that the product was unable to perform this test and was not included in any averaging. In the Price/Performance Ratio scatter chart, product codes 4 and 5 should be switched; the above-mentioned price corrections also affect the scatter chart.

We've taken steps to ensure that such errors don't happen again. We're also planning an update on more recent accelerator boards, possibly including the new 68030 boards. Meanwhile, if you'd like a reprint of the corrected Labs Report, please send a self-addressed stamped envelope to MacUser Labs, Accelerator Reprint, 950 Tower Lane, 18th floor, Foster City, CA 94404.

EASY DOES IT

Regarding our February '88 article "Open Door Policy" (on the new *Easy Access* tools included with the *System*), Peter Green of Apple's Office of Special Education Programs informs us that "the graphic on page 258, illustrating how to activate *Easy Access*, does not agree with the text. The text states that *Easy Access* is activated by pressing the Shift key five times in a row. This is correct. The graphic indicates that the Tab key is pressed five times to turn on Sticky Keys. This is incorrect."

He also notes that while Sticky Keys can be turned off by pressing two modifier keys at the same time, someone using a mouthstick would have difficulty hitting two modifier keys simultaneously and can simply press the Shift key five times in a row. He adds that Mouse Keys will, in fact, work with the Key Repeat setting turned off: The number keys (in Mouse Keys mode) will move the cursor a single pixel at a time. Finally, he notes that the correct address and telephone number of Apple's Office of Special Education Programs is 20525 Mariani Avenue, MS 36M, Cupertino, CA 95014; (408) 973-2732.

SLIDING HOME

Venicio L. Navarro of MacroMind notes that *VideoWorks II* (reviewed in our March '88 issue) is available directly from the publisher (MacroMind, 1028 W. Wolfram, Chicago, IL 60057; (312) 871-0987) as well as through distributors, and adds that our reviewer overlooked the STEP command (in the Overview window of the program) that lets the user manually advance one slide at a time.

ALIVE AND KICKING

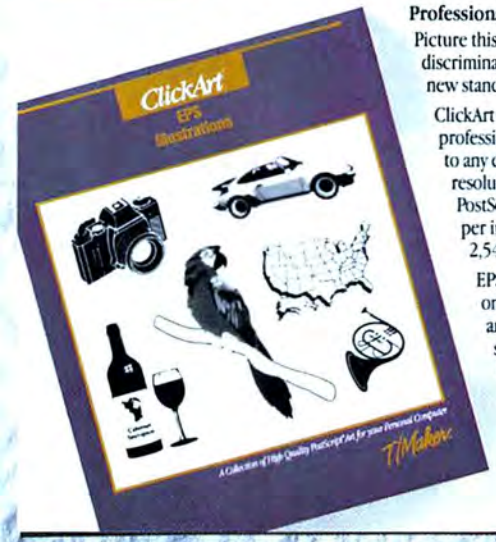
Rumors of *TK!Solver*'s death have been grossly exaggerated. In our March '88 issue, a Quick Click on *Eureka: The Solver* incorrectly stated that its predecessor, *TK!Solver*, was no longer being sold. This high-end mathematical calculation program was removed from the Macintosh market for a short period in 1985, but was resurrected by Universal Technical Systems. Version 1.5 is available for $200 from Universal Technical Systems, 1220 Rock Street, Rockford, IL 61101; (800) 435-7887 or (815) 963-2220.

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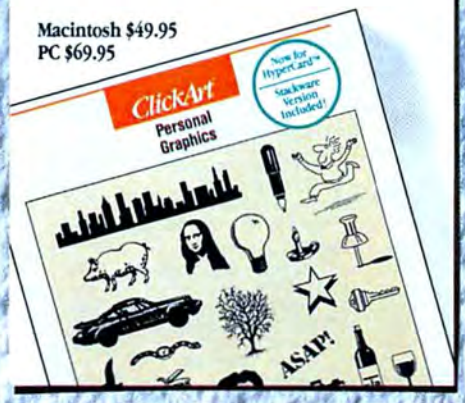


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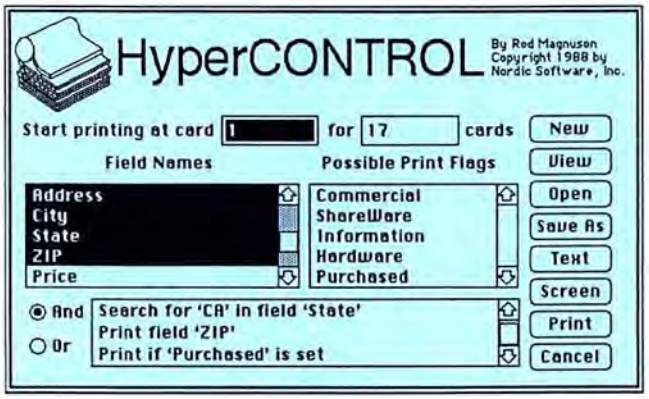
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I Can't Believe I Had to Print the Whole Thing

Anyone who's ever used *HyperCard* knows that printed output is the program's worst feature. You may only want to print a few cards, but *HyperCard* wants to print the whole stack — and ultimately, it's what *HyperCard* wants that counts. At least, until now. Nordic Software has just released *HyperCONTROL*, a *HyperCard* add-on that lets you determine what your printer produces.



Why print the whole stack? *HyperControl* lets you define a print selection and lets you rearrange the printed fields into a new order or layout.

HyperCONTROL lets you print selected cards by using buttons, or by conducting substring searches among the cards' fields. It also lets you move fields to different lines and place several fields on the same line — handy features to have when you're printing mailing labels. Other *HyperCONTROL* features let you calculate field totals and save field layouts as documents.

HyperCONTROL is available for $59.95 (yes, we know that's ten bucks more than *HyperCard*, but hey, it's only money) from Nordic Software, 3939 N. 48th, Lincoln, NE 68504; (800) 228-0417, or in Nebraska, (402) 466-6502.

Activision's *Reports!* just released at press time, also lets you control *Hypercard*'s tendency to overprint *Reports!* Reports can be customized using HyperTalk. Price: $99.95. (Yes, we know that's fifty bucks more than *HyperCard*.) Contact Activision at P.O. Box 7286, Mountain View, CA 94039.

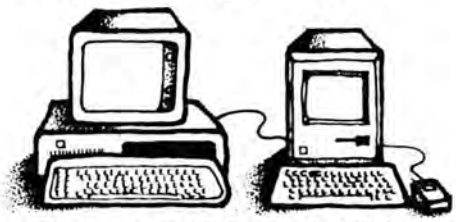
— *Russell Ito*

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Clear and colored transparency films are emulsion-treated to provide similar benefits. For more information on LASEREDGE papers and films, contact CG Graphic Arts Supply, 481 Washington Street, New York, NY 10013; (212) 925-5332.

— Jon Zilber

Roll Over, QWERTY

It was absolute chaos in the *MacUser* offices. People were screaming and fainting, all because of a simple misunderstanding. Seems someone overheard someone else talking about dozens of Dvorak clones spreading throughout the Mac community!

Relax. They weren't talking about our esteemed Anti-Editor — they were talking about *Electric Dvorak*, a freeware program that converts the Mac keyboard from the traditional QWERTY layout to the more efficient Dvorak layout.

When the typewriter was developed in 1872, you had to type slowly to keep the keys from jamming — 20 words per minute was about all they could handle. So the keyboard was given a user-hostile key layout designed to slow down typists. In 1936, August Dvorak realized there was no longer any need to enforce the 20-wpm speed limit and developed the optimized keyboard rearrangement that bears his name. The traditional QWERTY layout (named after the top left cluster of letters) has persisted, but the Dvorak alternative is gradually growing in popularity.

The Dvorak layout puts the most frequently used letters on the "home" row and keeps commonly used letter combinations near each other (but placed so that you rarely have to use the same finger for consecutive letters). The new layout takes a little getting used to, but the payoff is worth it. Studies show that an average typist's fingers travel 16 miles per day on a QWERTY keyboard, versus only one mile a day for Dvorak typists. The result is faster typing and less finger fatigue.



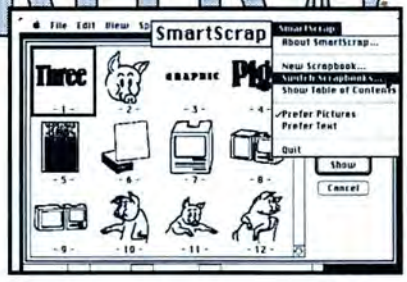
The Dvorak keyboard format increases typing efficiency and reduces finger fatigue. *Electric Dvorak* lets you toggle between Dvorak and traditional QWERTY keyboard layouts.

Once installed on your Mac, *Electric Dvorak* lets you toggle between QWERTY and Dvorak layouts with a simple Command-Shift-5. The author encourages free distribution of the software if you can find a copy from a user group or on a bulletin board. If you can't find it, send a formatted disk and a self-addressed stamped envelope or $5 to Tom Phoenix, P.O. Box 265-ed, Portland, OR 97207-0265. The disk includes a manual, information about Dvorak International, a Dvorak layout card to keep handy, and ample doses of Mr. Phoenix's sense of humor (such as his suggestions about what to do when your keys get depressed).

— Jon Zilber

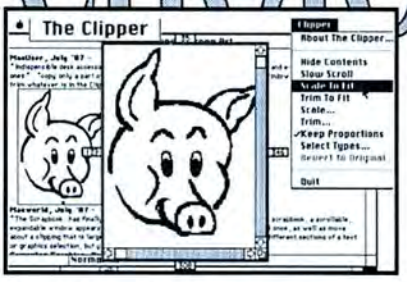
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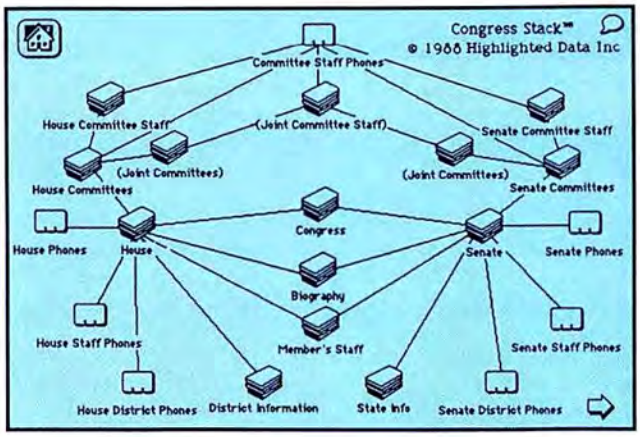
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Capitol Idea

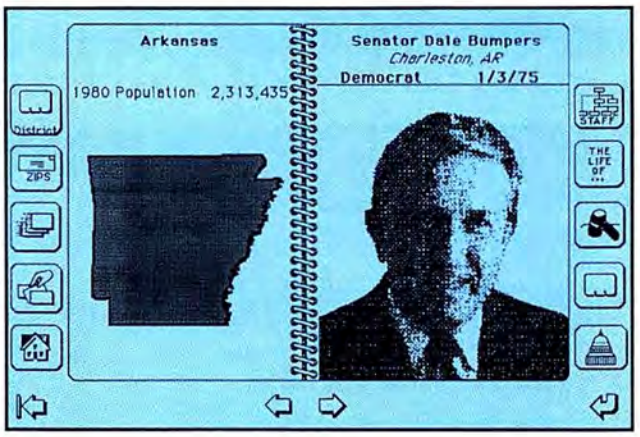
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— *Jon Zilber*



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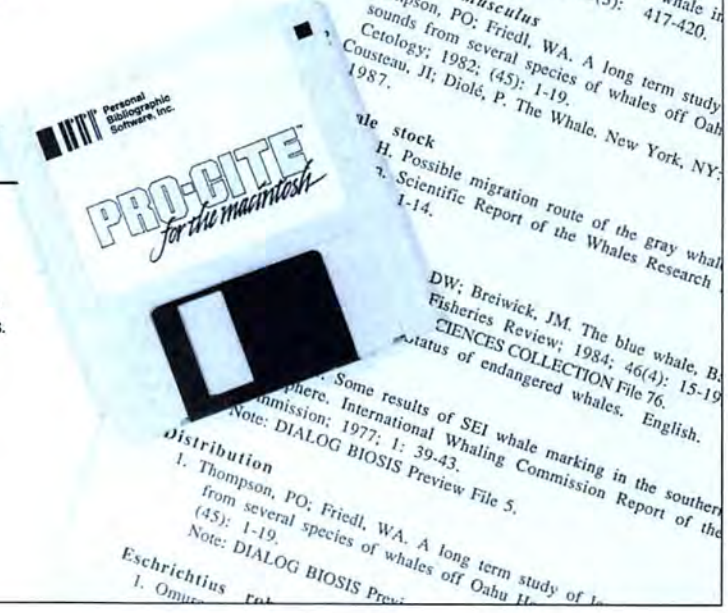
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Signs of the Times

Computers and communications come together in Richard L. Smith's *American Sign Language Fingerspelling* font and training exercises. ASL is the primary language for many of the 16 million deaf and hearing-impaired people in the U.S., and for hearing people who interact with the deaf community.

The font set contains each letter of the alphabet in the ASL signed form. The fingerspellings fonts are available in five sizes (14 through 48 point) and five type styles (plain, bold, shadow, italic, and underline). The ASL finger fonts can be used in different applications, such as graphics, word processing, and BASIC programs. Once installed in your *System*, "ASL Fingers" appears in the Font menu, and words can be typed in or converted to ASL. English words can appear alongside fingerspelling, a boon for beginners with the ASL alphabet.

BannerS, included as a companion to the font, is a training program that displays words spelled in ASL. You can control the speed at which *BannerS*' fingerspelling messages flow across the page, to develop your reading skills.

American Sign Language Fingerspelling is a non-profit application available at no cost from Richard L. Smith, 54 Bayberry Drive, Clifton Park, NY 12065; just send a blank disk and post-paid self-addressed envelope.

— *Laura Johnson*

DIALOG BOX OF THE MONTH

Some things are best left unknown. Some things are best left alone. At least, that seems to be the conclusion to be drawn here.

Our intrepid reader, Kevin Thompson of Batesville, AR, risked this punishment while using *MacNosy*. "I got the box while working with *MacNosy* (v. 2.45) on a 512K Mac with a RAMdisk installed. The box came up whenever I tried to pull down the constants table for the file I was disassembling. I'm not blind yet, but one eye is getting a little blurry."

To reward him for his courage, we've sent Kevin a check for $25, and we'll do the same for you if you send us a dialog box that's equally *well* . . . interesting. Give us the juicy details, and we'll make sure you save a copy of your screen in *MacPaint* format (that's COMMAND-SHIFT-3) on disk, so we can reproduce your masterpiece here at the office. Send your submissions to Dialog Herb c/o *MacUser*, 950 Tower Lane, 18th floor, Foster City, CA 94404. No calls, please.

— *H.D. Plant*



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SCSI Power

by Jim Seymour

Among the most important advantages of the Macintosh Plus, SE, and Mac II — indeed, second in importance only, in my estimation, to the true expansion slots in the Mac II — are the machines' SCSI ports. By in effect bringing part of the computer's bus out to an external connector, Apple added convenience, power, and flexibility to a line of machines previously famous only for the first of those three much-desired traits

Yet I still find a lot of confusion among fellow business users of Macintoshes about that SCSI connection, and about just why it's such an important and powerful built-in feature.

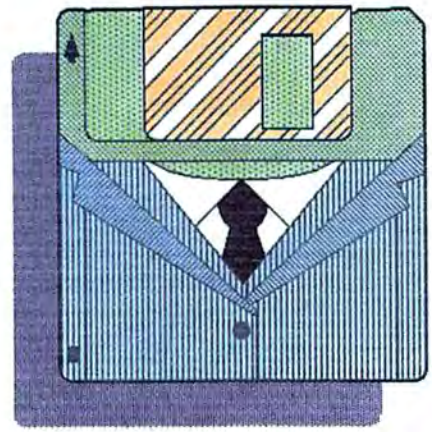
The confusion doesn't grow out of technical specs, such as data-transfer rates. And it doesn't arise, at least for awhile, over SCSI peripheral cables vs. SCSI system cables, nor over device numbers, nor over the number of SCSI terminators needed and whether they're built-in or external — though both Apple and third-party SCSI-peripherals vendors could have done a lot better job with all that.

The problem, simply put, is that many users don't know what the hell to do with that SCSI port. Maybe Apple needs to get some "hardware features evangelists" out there, too.

But the first time a Mac user adds on an external hard disk drive, or tape back-up unit, or scanner, or another device that uses that SCSI port, he catches on. Quickly.

Especially if he comes from the MS-DOS world.

Because instead of having to "go under the hood," as one does with IBM PCs and compatibles, and installing a new interface card, he just plugs the new peripheral into the SCSI connector, daisychaining it if it's not the first external SCSI device, and is almost immediately up and running.



I've added new SCSI devices to my Mac II in less than a minute, including checking for device-number conflicts. On a good day it takes me twenty to thirty minutes or more to wrestle one of the MS-DOS PCs in my office out of its floor stand and up onto the desk, pull the infamous five sheet metal screws on the back of the cabinet, slide the lid off, insert the new card, screw it down, replace the lid, replace those five screws, connect the cable required by the new device, then wriggle the whole thing back off the desk and onto the floor again.

By bringing the SCSI expansion bus out of the box to an external connector, Apple not only saved slots for Macintosh II users and made one-slot operation practical for the SE, they also made reconfiguring your system far easier.

Of course those same benefits are available to 512KE and Mac Plus owners, too, through both Apple and third-party SCSI-port aftermarket activity.

Though I usually have a daisychain of three or four devices hanging off my Macintosh's SCSI port, I find the possibilities of external hard disk drives the most important if least understood advantages of built-in SCSI connections.

And one of my favorite uses of external hard disk drives has become backing-up Macintosh *internal* hard disks.

In addition to the standard internal (Quantum) 40-MB hard disk in my Mac II, I also have a Priam 103-MB external hard disk on the SCSI port. There are larger-capacity, slightly faster, slightly less expensive hard disks for Macs, but none I've found offer the quality and reliability of that Priam.

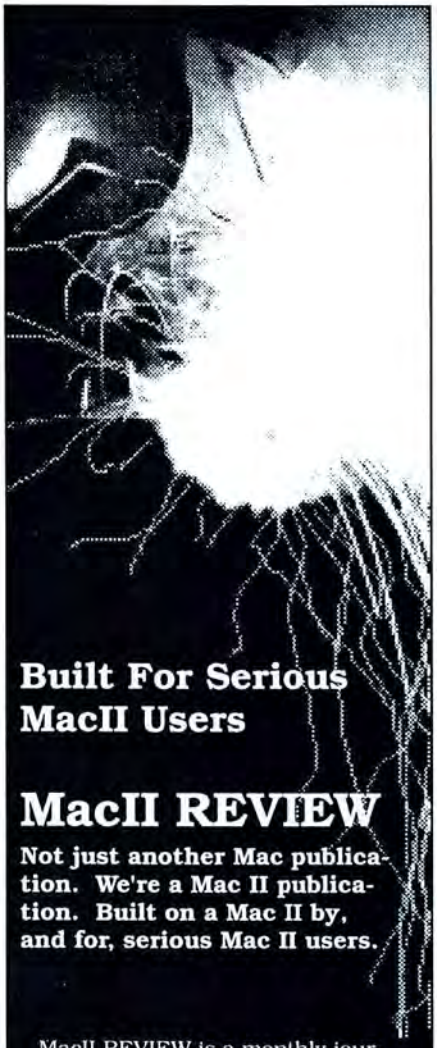
Coming out of the older world of eight-inch hard disks for minicomputers, Priam understands the need for reliability. The EM-100 is spec'd at 40,000 hours MTBF (mean time between failures), twice the usual MTBF figure for Mac and PC hard disks. The average access time is 28 milliseconds — not quite as fast as the very fastest Mac hard disks, but fast, period. Thanks to that SCSI connection, the effective data-transfer rate is very high too, at 625 kilobits per second. And it's data-transfer rates, not just typical access times, that really tell the story of hard-disk speed.

All that makes the external Priam SCSI drive a superb primary-storage medium. Mine, though, also serves as a quick-and-dirty — and enormously convenient — back-up system.

Back-up devices and software generally for the Mac have lagged surprisingly far behind back-up systems and software for IBM PCs and compatibles. Even the best Mac software for backing up to disks is clumsier and less well designed than similar programs for PCs. And Mac tape back-up units have lagged as well, with slower operation, fewer options and, in my experience and that of a lot of corporate Mac users I know, less reliability.

By this time next year, that may not matter very much.

I'm in the camp that believes the Sony/Hewlett-Packard efforts to



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standardize on a DAT (digital audio tape cassette) format for use with small computers will produce the best, cheapest, most reliable back-up medium we've seen yet.

But we won't see the first computer-DAT units on the market here 'til later this year, and it will be at least early to mid-1989 before we see very many positioned specifically as back-up devices (running, incidentally, on that SCSI port).

In the meantime, what's a serious Mac owner to do?

What *this* serious Mac owner does, and an increasing number of business Mac users do, is back up the primary, internal hard disk to an external SCSI hard disk drive, which is where my Priam EM100 comes in.

At a little over a hundred megabytes, it can hold at least two full back-ups of the internal 40 MB disk (depending on how much data is on that drive), with at least twenty-odd megabytes left over for storing those programs (and associated data files) that I use only once in a blue moon — and wouldn't be shattered to lose.

For me, backing up on the Macintosh has become incredibly easy. I just draw a rectangle around all the folders on the desktop of that primary, internal drive, then drag them to the BAKUP folder I keep on the desktop of the external drive — and the process is underway. (Actually, I cheat a little: I use two monitors with my Macintosh II, so I can clearly see both desktops at once.)

I walk away for a cup of coffee and a few minutes' schmooz with a colleague, then walk back to find the back-up completed.

Aside from the speed and convenience — and in back-ups, convenience is very nearly everything: if it isn't convenient, you're not going to *do* it! — this kind of hard-disk-to-hard-disk back-up has one more very substantial advantage over conventional floppy back-up — and a couple of disadvantages too, about which more in a moment.

First, if and when that internal disk goes south, I'm not going to have to wait while it's being repaired (or give up and buy a new one), then dig out my most recent set of back-up disks, or tape, then go through a tedious restoration routine — hoping all the while it's going to work this time.

Instead, I'll just boot off a System floppy once, rename the extra back-up System folder I have squirreled away on that external disk (kept under a different name, so as not to cause problems each time I boot), pull down the Control Panel, and make that Priam the start-up disk.

I'll open the BAKUP folder on the Priam to spread those folders around its desktop and snap: I'm back in business. Almost instantly.

There are two drawbacks to this kind of back-up, one or both of which may be important to you. The first is that since I keep that Priam connected to the Mac, I'm not including off-site storage in my arsenal of back-up insurance policies. If fire, water, flood, or junkies get to my Mac, that back-up's going to be just as long-gone as the data on the primary drive inside the Mac.

(Sure, I could unplug the Priam every night and lock it in a fireproof vault. But I'm no defense contractor; are you? That kind of stuff may be fine for spooks and missile designers, but it's not a very likely answer for the rest of us.)

Second, all this doesn't come cheap. The Priam drive lists for $2,695, and can be bought for about $2,100 from the usual discounters. Even given its splendid performance, that's a lot of money per megabyte, especially if you're using it mainly as back-up storage.

But for me, it's worth it. And when I've discussed this approach with corporate Macintosh users and micro managers, an awful lot of them have concluded it's cost effective for them, too.

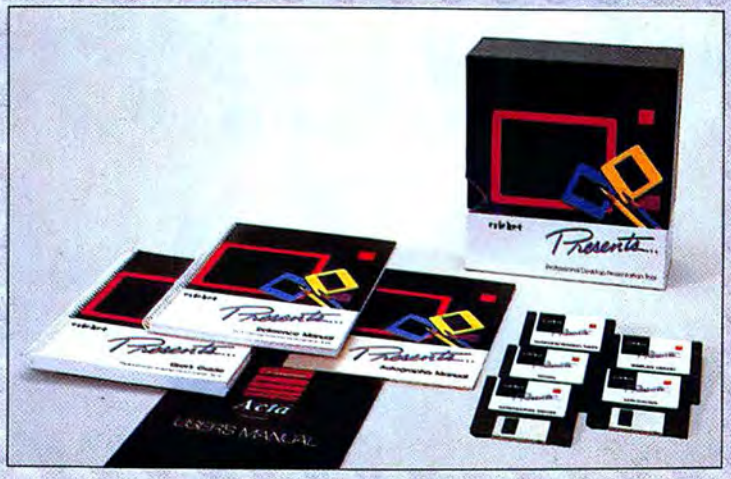
Macintosh IIs aren't cheap to begin with; adding another 10 to 15 percent to the tab for this kind of industrial-strength peace of mind is a bargain when you view the Macintosh as a business tool.

And the whole scheme is made possible by that ordinary-looking little SCSI connector on the backplane of the Mac.

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A Total Presentation Environment Developing a presentation requires a diverse range of tasks—planning, text editing, creation of graphs and illustrations, speech-writing AND the production of the actual presentation media. Cricket Presents provides *all* the tools you need to get the whole job done quickly and efficiently.

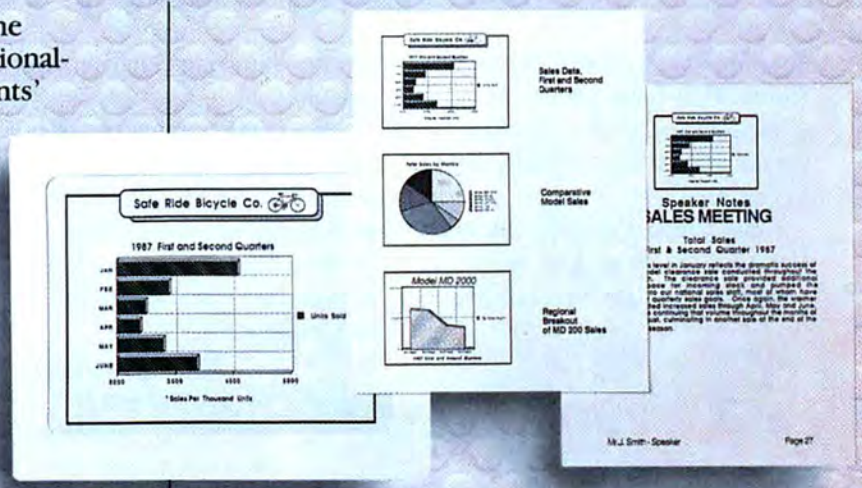
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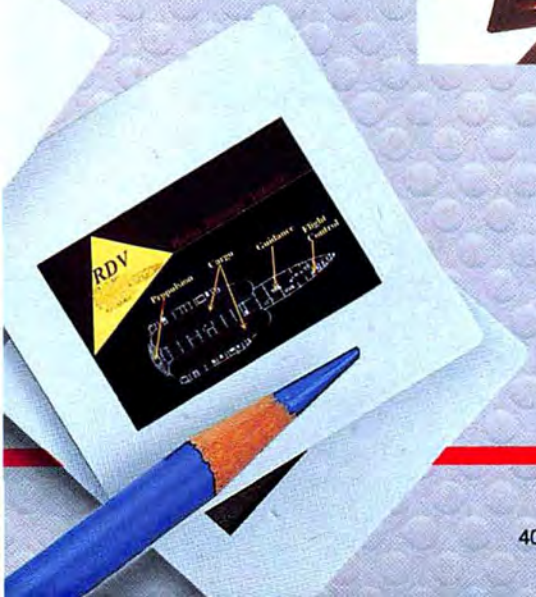
35mm Slides From Autographix Imaging Centers All it takes is a modem or a postage stamp. Cricket Presents' built-in Autographix Driver lets you send your files either via modem or mail to your nearest Autographix Imaging Center. Autographix will produce your slides and have them on your desk within 24 hours*.



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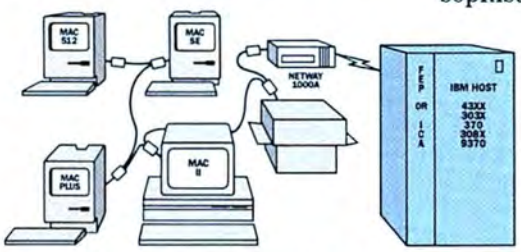
cricket software

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How your Mac family and your 3270 family can be one big happy family.

Your Macintoshes and your mainframe. They have some truly amazing capabilities. Except for one: the ability to easily talk to one another.

But there is a universal solution that unites all your Macs —the 512 KE, the Plus, the SE,



Corporate workgroup using AppleTalk.

and even the Mac II—with your 3270 world. It's Tri-Data's NETWAY 1000A.

This 3270 gateway for your Macs delivers perfect 3274 controller emulation. So it doesn't compromise your SNA or Bisync mainframe environment one bit.

Since we connect to AppleTalk, you are part of a local area network filled with high-end workgroup solutions. Giving you the best of both worlds: 3270 workstation capabilities and a sophisticated LAN.

But that's not all. With our file transfer capability, your Mac and mainframe can exchange text, Mac application files, binary files, and even IBM PC files.

And with our Multifinder compatibility, you can integrate an IBM host session with several Mac applications. Without disconnecting from the host.

Given all these capabilities, you may think NETWAY 1000A is an expensive solution. Well, you're in for a pleasant surprise. For a workgroup of 16 Macs, NETWAY 1000A costs less than $200 per active 3278 terminal session.

And if all this sounds too good to be true, here's another pleasant surprise. Tri-Data's NETWAY 1000A has been delivering the best Mac-to-mainframe solutions for more than two years. For many of the biggest names in the Fortune 1000.

The Tri-Data NETWAY 1000A. Exactly what your Mac family, 3270 family, and, ultimately, your corporate family needs.

Contact us about our demo program and connect your Macintosh to your IBM host today. Tri-Data, 505 E. Middlefield Road, Mountain View, CA 94043, Telex: 172282, AppleLink: D0120, (415) 969-3700.

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by Robert R. Wiggins

Strategic Infiltration

Apple is a sneaky company. Of course, it's had to be. When your competition is one of the largest and most successful companies in the world, you don't try a direct assault. Instead, you adopt strategies that target chinks in the competitor's armor and holes in the competitor's product line. When the Macintosh was first introduced, it was heralded as the computer for "the rest of us," meaning people who didn't have the time or inclination to learn the complicated commands necessary to use the competition's computers. The Mac's graphic interface, with folders and icons and always available pull-down menus, made using a computer palatable and even fun. Business users, however, especially those who had become adept at using arcane commands, laughed at the Mac and called it a "toy" computer. The Mac sold well, but it didn't really penetrate the competition's market; rather, it expanded the total market by bringing "the rest of us" into it.

Apple's next strategy, The Macintosh Office, was built around networking. The competition was awash in complicated, expensive, and confusing networking options. So Apple introduced AppleTalk, an easy-to-use and inexpensive networking solution, with the cornerstone of the strategy being the LaserWriter, a shared printer capable of very high-quality text and graphic output. The LaserWriter was such an outstanding product that it attracted a lot of attention and sold a lot of AppleTalk networks. Business users began to take the Macintosh more seriously after these announcements and the introduction of the Macintosh Plus, and Apple began to achieve some penetration into the business market.

Apple's next strategy was something it discovered rather than something it planned. Apple discovered that



DAVE JOLY

many companies were buying Macintoshes only for specific functions, especially desktop publishing. But once a Macintosh was in the door, people would discover new uses for it and the presence of the first system would lead to the purchase of multiple systems. This became known as the "Trojan niche" strategy. Once Apple discovered this strategy, it actively encouraged it and tried to create new Trojan niches to get those first, critical Macs into companies. Desktop presentation, desktop communications, and desktop engineering were all attempts to capitalize on this phenomenon.

For its next strategy, Apple returned to its roots: product innovation and excellence. The Mac II once again showed that Apple could engineer great products, and the Mac SE updated the "classic" Mac with the features users had been asking for.

Over the years that these strategies were deployed, Apple was growing up. It was no longer a small company, and John Sculley, with his strong marketing background, had breathed new life into the marketing end of the business. So in the year since the Macintosh II and SE were introduced, Apple has embarked on several concurrent and complementary strategies.

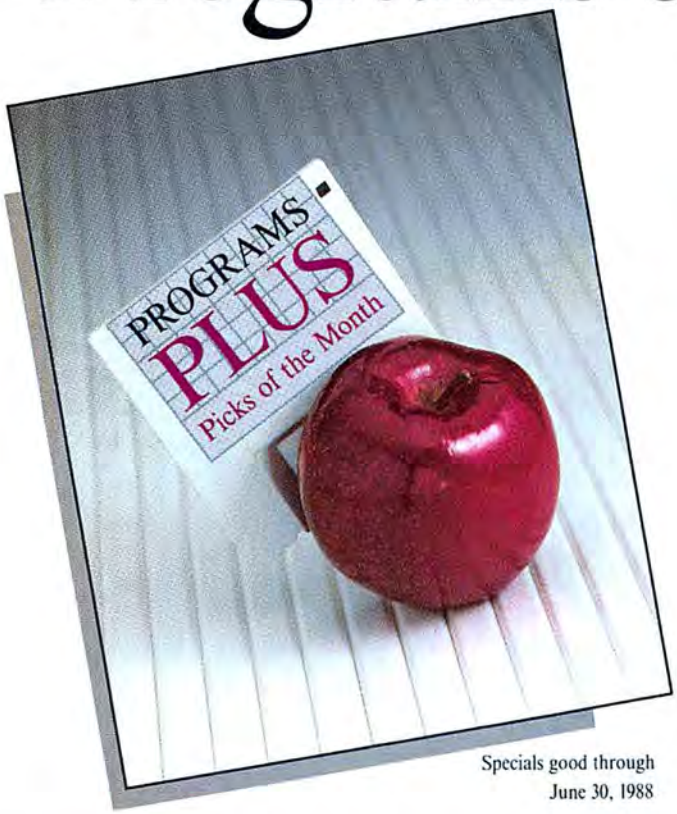
The DEC Connection: Market research revealed that more than a third of all Digital Equipment Corporation minicomputer sites also had Macintoshes installed. To capitalize on this, Apple set out to encourage third parties to develop DEC connectivity products and began work on some of its own. This strategy culminated in the announcement in 1988 of a strategic alliance between Apple and DEC. This strategy has just begun to unwind, and there is much more to come.

The IBM PC Connection: Apple has long since recognized that if it wants to increase its share of the office market, it has to coexist with IBM. The IBM PC is too entrenched to be supplanted in most companies, but peaceful coexistence will allow the Macintosh's entry. This is a multifaceted strategy.

File Sharing: The lowest-level tactic is to allow users to share data files. This has been implemented primarily by third parties, such as Microsoft, Aldus, and Ashton-Tate, whose products run on both families of machines. Several products from third-party developers support other vendors' IBM PC file formats, such as *4th Dimension*, which can read and write *dBASE III* files, and *Excel,* which can read and write *Lotus 1-2-3* .WKS files.

Networking: Because Apple has attractive peripherals, such as the LaserWriter, it made sense to try to lure PCs into the party with an AppleTalk capability. Letting PCs get to AppleShare file servers was another excellent tactic. Apple will continue to attack along this front.

Programs & Peripherals



Specials good through
June 30, 1988

MacBottom SCSI Hard Disk Drives by PCPC



MacBottom SCSI Drives arrive completely formatted with easy-to-use software including a print spooler, a floppy disk duplicator and a backup program. *MacBottoms* come with everything you need to get started including cables, terminators, and an additional SCSI port. You can even get a Hayes compatible 1200 baud modem built right in. *MacBottoms* weigh less than five pounds and measure just two inches tall but no other hard disk stacks up!

Available in either platinum or beige color. Please specify.

MacBottom 21 MB Hard Drive **749.**
MacBottom 32 MB Hard Drive **879.**
MacBottom 45 MB Hard Drive **1139.**
MacBottom 70 MB Hard Drive **1395.**
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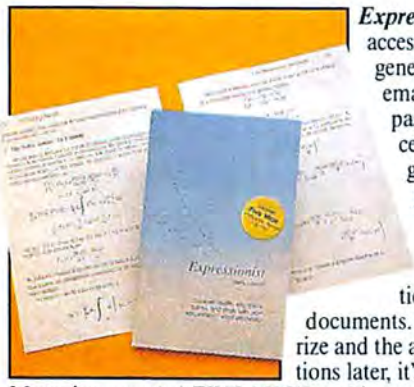
"Draw it again, Sam" by ABA Software



"Draw it again, Sam" is a new object-oriented drawing program sharing many of the features of MacDraw and MacDraft but it's unique in letting you create your own limitless *text and graphics libraries.* Store and retrieve frequently used art, text, or logos with a click of the mouse. *"Draw it again, Sam"* also allows you to produce color separations or cell animation quickly and easily. And, *"Draw it again, Sam"* uses "Quick Draws" drawing modes to their fullest potential creating magnificent visual effects!

"Draw it again, Sam"..... **89.**

Expressionist by Allan Bonadio Assoc.



Expressionist is a unique desk accessory that allows you to generate typeset quality mathematical expressions to be pasted into any word processor or page layout program. *Expressionist* allows you to enter equations as easily as you enter text using the keyboard and icons to generate equation symbols to use in your documents. With nothing to memorize and the ability to re-edit your equations later, it's no wonder MacUser Magazine awarded FIVE MICE to this powerful yet simple program!

Expressionist **46.**

Utility Software

Apple Computer Switcher Const. Kit	14.	Read-It! TS *(For Thunderscan)*	79.
ALSoft Disk Express 1.10	26.	Read-It! O.C.R. *(For Image Scanners)*	199.
Font/DA Juggler Plus	32.	**Software Power** Power-op Disk Optimizer	33.
Berkeley System Design Stepping Out II	54.	**Software Supply**	
Beyond Inc. Menu Fonts 2	32.	Suitcase or Power Station	38.
CE Software QuicKeys *(Macro Program)*	57.	**SRT** MacTree	38.
DiskTop 3.0 or CalendarMaker 3.0	29.	**SuperMac Software** SuperSpool	42.
Central Point Software		SuperLaserSpool	82.
Copy II Mac *(Includes MacTools)*	20.	Multi-User SuperLaserSpool	199.
Electronic Arts Disk Tools Plus	31.	Diskfit 1.4	54.
Fifth Generation Systems		Network Diskfit 1.3	203.
FastBack For The Macintosh	59.	Sentinel	155.
Ideaform Disk Quick V2.10	25.	**Synex** Mac Envelope	15.
HyperBook Maker	30.	Mac Invoice	25.
Infosphere MacServe *(Network Software)*	158.	**TOPS** Tops For The Macintosh 2.0	
LaserServe *(LaserWriter Print Spooler)*	62.	or Net Print	119.
Olduvai Software ADBridge	67.	**Williams & Macias**	
DA-Switcher II	25.	myDiskLabeler w/Color	31.
Font Sharer	149.	myDiskLabeler w/LaserWriter Option	34.
Icon-It! *(Assign Icons to Menu Items)*	39.	**Working Software, Inc.** Findswell	29.

Desk Accessory Programs

Affinity Microsystems Tempo II	94.	**Imagine Software**	
AffiniFile	46.	Smart Alarms & Appointment Diary	35.
Borland SideKick V2.0	63.	Multi-User Appointment Diary	
Cortland		with Smart Alarms	89.
Top Desk	32.	**Solutions, International**	
Greene, Inc.		SmartScrap & The Clipper	35.
QuickDex 1.4	32.	**Symmetry** HyperDA *(Req. 512K)*	38.

Languages

Apple Computer MacPascal	99.	**Microsoft**	
Borland Turbo Pascal	63.	Microsoft Basic Interpreter 3.0	65.
Turbo Pascal Numerical Methods	65.	Microsoft Basic Compiler 1.0	127.
Turbo Pascal Tutor	46.	**THINK Technologies**	
Consulair		Lightspeed C	95.
Macintosh 68000 Development System	59.	Lightspeed Pascal	65.
Mainstay		CAPP's for Lightspeed C or	
V.I.P. *(Visual Interactive Programming)*	79.	CAPP's for Lightspeed Pascal	49.

Communications Software

Apple Computer MacTerminal	99.	**Software Ventures**	
Compuserve Compuserve Starter Kit	24.	Microphone II *(Includes Glue)*	209.
DataViz MacLink Plus with Cable	145.	**Think Technologies, Inc.**	
Freesoft Red Ryder V10	49.	InBox-Starter Kit V2.0	
Palantir InTalk V3	99.	*(3 Personal Connections)*	199.

to Polish Up Your Mac...

MacKids Educational Programs by Nordic Software



MacKids is a complete series of twelve quality educational software products for the Mac specifically designed to teach and entertain kids. Whether your children are preschoolers or young adults, there's a *Mac Kids* package that will give them the learning edge.

Preschool Disk 1 (3-7), Preschool Disk 2 (3-7), CoinWorks (4-12), ClockWorks (4-10), Early Elementary 1 (6-9), Lemonade Stand (6-16), FlashWorks (6-adult), Naval Battle (6-adult), Word Search (6-adult), Alphabetizer (7-adult), EarthWorks (10-adult), or Bodyworks (10-adult).

Each Program **29.**

A+ Mouse and A+ Mouse ADB by Mouse Systems



The ***A+ Mouse*** is the most reliable mouse available for your Macintosh. It has an MTBF (Mean Time Between Failure) rating in excess of 30 years, and is the only mouse available with a lifetime warranty. This is because, as an Optical Mouse, it has absolutely no moving parts to breakdown! The *A+ Mouse* uses a beam of light reflecting off a mirror-like pad to provide the most accurate and sensitive pointing device now available, with the ability to measure even the slightest hand movement. Order the *A+ Mouse* today, in either the normal or new ADB interface, and get the mouse with the 3 best features any mouse could offer, nothing to break, nothing to clean, and nothing to worry about.

A+ Mouse **67.**
A+ Mouse ADB **87.**

Smash Hit Raquetball II by Primera Software



Smash Hit Racquetball II is the ultimate one or two player racquetball game available for the Macintosh. This is the winner of the MacUser five mouse award for it's speed of play and the audio/visual experience players enjoy. You can tune up your corner kill shots against the computer or get revenge against your favorite human opponent via a modem or Appletalk connection or even through a direct connection. *Smash Hit Racquetball II* provides digitized sound, over 270 frames of animation, four ability levels, instant replay and more!

Smash Hit Racquetball II **21.**

Mac Sqz! by Turner Hall Publishing



Mac Sqz! is a combination desk accessory and application for use with Microsoft Excel. The major feature of this package is the ability to compress Excel data files, data folders or even entire Excel data disks by as much as 95%, with 0% effort on your part. It can be set up to automatically reduce your spreadsheets when you save them and expand them back to their original size when they are opened, with absolutely no loss of data. Other built-in features include file level password security, annotation, and file history, which records file's list of annotations, linked worksheets, significant dates and file sized to create an audit trail. Excel users, call today for your copy of *Mac Sqz!* on special this month!

Mac Sqz! **49.**

Epic Modems by Epic Technology



Epic Technology offers a full line of internal and external multi-speed modems for any Macintosh. The *Epic 2400II* is an internal 2400 baud modem for the Macintosh II, and the *Epic 2400SE* is their offering for an internal 2400 baud modem for the Mac SE. Their *Epic 2400 Plus* is an external 2400 baud modem for use with any computer. All *Epic* modems are produced here in the U.S.A. and come with a full five year warranty. Their popular features include, Hayes compatibility, data to voice switching, audio monitor, redial on busy, DTMF/pulse or mixed dialing, and full self test modes. Call today and inquire about *Epic's* full line of competitively priced modems.

Epic 2400II **249.**
Epic 2400SE **249.**
Epic 2400 Plus **155.**

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...-Processor *(Mac II)*	1049.
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...int 800K External Drive	185.
...C Deluxe Option Board	129.
...eStack 20 Ext Subsystem *...lus/SE/II)*	569.
...k 60 Ext Subsystem *...Plus/SE/II)*	849.
...40 I or R	839.
...100 I or R	1489.
...43 Internal	649.
...0 II 102 Internal	1189.
60MB Tape Backup *(MacPlus/SE/II)*	739.
Cutting Edge Cutting Edge 800k Drive	175.
Cutting Edge Wedge XL 30 Plus SCSI Hard Drive	649.
Cutting Edge Wedge XL 45 Plus SCSI Hard Drive	829.
Dove Computer Corporation	
MacSnap 524 *(512K to 1MB)*	165.
MacSnap 524E *(512E to 1MB)*	145.
MacSnap 524S *(512E to 1MB w/SCSI)*	219.
MacSnap 548 *(512K to 2MB)* or 548E *(512E to 2MB)*	359.
MacSnap 548S *(512E to 2MB w/SCSI)*	429.
MacSnap Plus 2 *(MacPlus to 2MB Non Expandable)*	265.
MacSnap 2S or 2H *(1MB to 2.5MB for MacPlus/SE)*	449.
MacSnap 4S or 4H *(1MB to 4MB for MacPlus/SE)*	879.
SCSI Interface/Port	85.
MacSnap Toolkit *(torx driver, opener & grounding set)*	15.
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Emac 20 Deluxe	585.
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Turbo SE *(16 Mhz 68000 Accelerator for the Mac SE)*	399.
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MacBottom HD-70 *(70MB SCSI Hard Disk) Plat only*	***Special*** 1395.
MacBottom IHD-144 *(Mac II)*	2195.
WSI *(connects HD-20 SCSI)*	295.
Rodime Rodime 20 Plus *(External 20MB SCSI)*	629.
Rodime 201 Plus *(Internal 20MB for Mac Plus)*	629.
Rodime 45 Plus *(External 45MB SCSI)*	939.
Rodime 450RX *(Internal 45MB for Mac SE & Mac II)*	829.

Laser Printers & Digitizers

AST Research TurboLaser P/S	3559.
TurboScan *(Sheetfeed model)*	1199.
TurboScan *(Flatbed model)*	1329.
Impulse Impulse *(MacNifty)* Audio Digitizer V2.0 w/Soundwave	149.
Koala Technologies Corp.	
MacVision *(Digitizer)*	169.
Summagraphics	
MacTablet 12x12 size	379.
ThunderWare	
ThunderScan V4.0 with Power Port *(Mac 512K, 512K Enhanced, MacPlus, and Macintosh SE)*	199.
Mac II Power Accessory	42.

Accessories

Abaton ProPoint *(ADB Turbo Mouse for Mac SE & Mac II)*	119.
Bech-Tech Fanny Mac *(Beige or Platinum)*	65.
Cambridge Automation Numeric Turbo	99.
Central Products	
MacOpener *(All In One Mac Tool)*	16.
Curtis Manufacturing	
Diamond-Surge Suppressor-SP-1	29.
Emerald-Surge Suppressor-SP-2	36.
Ruby-Surge Suppressor-SPF-2	55.
Sapphire-Surge Suppressor-SPF-1	47.
Cutting Edge Cutting Edge EADB-105 *(Mac SE & Mac II)*	139.
DataDesk MAC-101 Keyboard/Beige *(128k/512k & MacPlus)*	139.
MAC-101 ADB Keyboard/Platinum *(Mac SE & Mac II)*	139.
Ergotron	
MacTilt or MacTilt SE *(Platinum Color)*	68.
Mouse Cleaner 360°	15.
I/O Design	
Mac Luggage in Navy or Platinum Gray	
Macinware Plus Carrying Case	69.
Macinware SE Carrying Case	79.
Imageware II Carrying Case	49.
Kalmar Designs	
Teakwood Roll-Top Disk Cases:	
Micro Cabinet *(holds 45 disks)*	14.
Double Micro Cabinet *(holds 90 disks)*	20.
Triple Micro Cabinet *(holds 135 disks)*	27.
Kensington External Disk Drive Cover	8.
Extra Long ADB Keyboard Cable	25.
Macintosh II Stand	20.
Macintosh II Monitor Cable Extension	33.
Mouse Pocket *(Reg. or ADB)*	8.
Mouseway *(Mousepad)*	8.
ImageWriter or ImageWriter II Cover	9.
Macintosh Plus/SE Dust Cover	9.
Mouse Cleaning Kit w/Pocket	17.
Disk Drive Cleaning Kit	20.
Tilt/Swivel	22.
Universal Copy Stand	23.
Apple Security Kit	34.
Polarizing Filter	33.
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Printer Muffler 132	51.
Masterpiece 400	63.
System Saver Mac *(Beige or Platinum)*	64.
Super Base	34.
System Saver SE	51.
Masterpiece Mac II	105.
A/B Box *(MacPlus Only)*	63.
Turbo Mouse *(Reg. or ADB)*	82.
Lightgate Felix *(Second Generation Pointing Device)*	99.
Mouse Systems	
A+ Mouse *(MacPlus)*	***Special*** 67.
A+ ADB Mouse *(Mac SE/Mac II)*	***Special*** 87.
Moustrak MousePad 7"x9" Size	8.
MousePad 9"x11" Size	9.
Moustrak L/F *(Low Friction)*	9.
Nuvotech EasyNet *(Specify Din 8 or DB-9)*	27.
Orange Micro Grappler C/Mac/GS *(Parallel Interface for the Mac)*	84.
Grappler L/Q *(Parallel Interface for 24 Pin & Laser Printers)*	99.
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Centech 3½" SS/DD Color Disks *(10)*	16.	Sony 3½" DS/DD Disks *(box of 10)*	18.
Fuji 3½" SS/DD Disks *(box of 10)*	13.	Fuji 3½" DS/DD Disks *(box of 10)*	19.
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Modems

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Epic 2400 Int. Mac II *(Hayes Compatible)*	***Special*** 249.
Epic 2400 Plus Ext *(Hayes Compatible)*	***Special*** 155.
Everex Emac 2400 Baud	225.
Hayes Microcomputing	
Smartmodem 1200	299.
Smartmodem 1200 Mac w/Smartcom II & Cable *(MacPlus)*	359.
Smartmodem 2400	449.
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Novation Novation Parrot 1200	93.
Prometheus	
Promodem 1200 *(Hayes Compatible)*	239.
Promodem 2400 *(Hayes Compatible)*	309.
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Net Modem V2400	489.
Net Modem X232	309.
Net Bridge	309.
Supra Corporation Supra Modem 2400	154.
U.S. Robotics	
Courier 1200 *(Hayes Compatible)*	199.
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Courier 2400E *(Hayes Compatible)*	379.
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Ashton Tate dBASE Mac 1.0 295.
Blythe Software Omnis 3 Plus/*Express* 279.
Borland Reflex Plus 165.
Chang Laboratories
C.A.T Contacts•Activities•Time 229.
Fox Software Fox Base Plus 214.
Fox Base Runtime 162.
Microsoft Microsoft File 1.05 120.
Nantucket Software
McMax *(dBase III Compatible)* 178.
Nashoba Systems FileMaker Plus 149.
Odesta Double Helix II 339.
ProVUE Development OverVUE 2.1E 149.
Software Discoveries
RecordHolderPlus 45.

Business Software

Bravo Technologies MacCalc 83.
Claris MacProject II Call
Cricket Software Cricket Graph 119.
Cricket Presents... 289.
Pict-O-Graph 105.
Deneba Software Comment 59.
Xtra 2.0 109.
Layered Notes For Excel or
Microsoft Works *(each)* 41.
Legisoft/Nolo Press WillMaker 2.0 30.
Lotus Jazz 1A 189.
Lundeen & Associates
WorksPlus Commands 62.
MacroPac International
101 Macros For Excel 49.
Mainstay Think 'n Time 61.
Mac Flow 2.0 or Mac Schedule 115.
Capture 38.
Micro Planning Software
Micro Planner Plus 299.
Microsoft
Microsoft Works 1.1 with Spellswell 189.
Microsoft Multiplan 1.11 120.
Microsoft Mail 1-4 users 195.
Microsoft Excel 1.04 239.
Microsoft PowerPoint 239.
North Edge Software Timeslips III 119.
Satori Software Bulk Mailer 3.0 79.
Bulk Mailer Plus 195.
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Legal Billing II 539.
Project Billing 409.
Shana Enterprises Fast Forms 72.
Turner Hall Publishing MacSQZ! *Special* 49.

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Claris MacWrite 5.0 Call
Living Videotext
More 1.1C *(Color Version)* 175.
Microsoft Microsoft Word 3.01 239.
Microsoft Write 114.
Symmetry Acta V2.0 36.
T/Maker Company
WriteNow V2.0 98.

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Aegis Development
Doug Clapp's Word Tools 42
A.L.P. Systems MacProof 3.0
(Requires MacPlus) 115.
Batteries Included Thunder! 1.23 31.
Deneba Software Spelling Coach 3.0
(Webster's/Medical/Legal/Hyphenation) 54.
Spelling Coach 3.0 Professional
(Adds Definitions & Thesaurus) 109.
Coach Merriam Webster's Thesaurus 2.0 36.
Lundeen & Associates
WorksPlus Spell 1.1 46.
Microlytics, Inc.
Word Finder *(Synonym Finder)* 35.
Sensible Software Sensible Grammar 57.
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Postcraft International, Inc.
Laser FX 115.
Laser FX Font Packs #1-8 *(each)* 30.
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Super Glue 52.
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Inventory Control 2.6 or
Professional Billing 2.6 239.
Rags to Riches GL, AR, or AP 120.
Layered Insight One Write 189.
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Managing Your Money 129.
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Monogram
Business Sense 279.
Dollars & $ense 4.0 81.
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Japanese Clip Art Scroll 1
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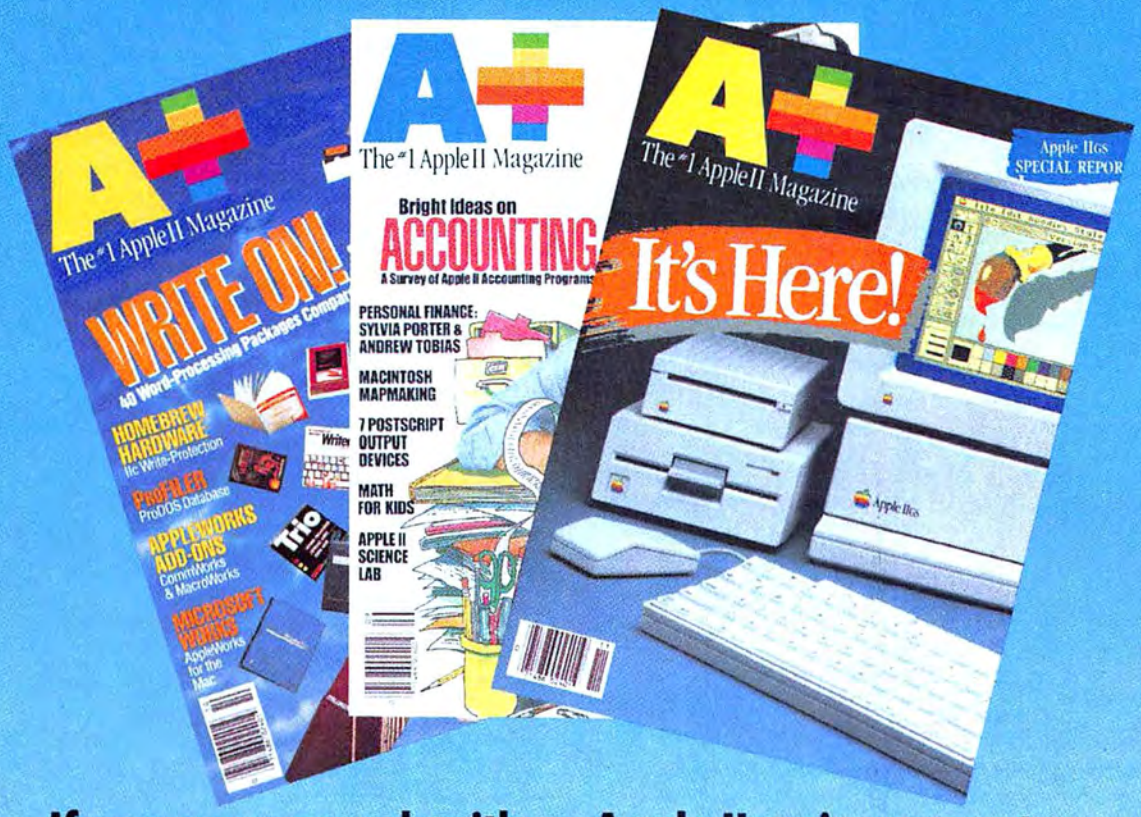
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Educational Programs *(each)* *Special* 29.
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Dinner at Eight-Silver Palate Bundle 51.
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Compatibility: The ultimate assault against a competitor is to eliminate the need for the competitor's product. Apple isn't doing this itself but through third parties is providing the capability to run MS-DOS software. The AST Mac286 is a hardware approach, and *PCSoft* is a software-emulation approach.

The IBM Mainframe Connection: Apple's agreement with DEC doesn't prevent it from also going after the IBM mainframe-terminal market. Many IBM PCs are used as mainframe terminals, and Apple couldn't replace those units with Macs without the same capability. Apple has always offered AppleLine, an external solution, but the Mac SE and II finally allow cards to be used. Apple's announcement of MacAPPC this year shows its commitment to supporting IBM's Systems Network Architecture as well.

The UNIX Connection: Apple has also made UNIX support part of its strategy, with its own implementation, *A/UX*.

Apple's new strategy is to be all things to all people. With the increasing breadth of its product line and the strength of Sculley's leadership, it looks like it might pull it off. Apple has faced the barriers and objections of the business market and addressed them one by one, until no one can say the Mac isn't a business computer.

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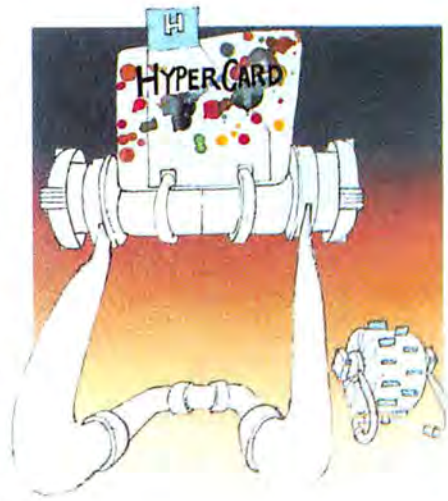
The *HyperCard* Workstation

by Henry Bortman

There has been ample time now for debate to rage about the uses of *HyperCard*. Many users are already finding it a valuable tool for organizing their Macintosh work environments. I, seeing it as overkill for a Rolodex substitute (my paper Rolodex does the job just fine), initially thought it was more hype than substance. I still don't buy the official line. It's not a "software erector set," unless the software you have in mind falls within a pretty limited category. I haven't found it particularly easy to use, not for producing a functional finished product. I want it to do things it can't do (such as sort on more than two different fields), and it does things I don't want it to do (such as save changes automatically when I thought I was just experimenting). After my first frustrated round with it, I reclaimed the 2.5 megs on my hard disk, for something I considered more useful.

Shortly thereafter, I was looking at a network-management system that had been built on a DEC MicroVAX II GPX, a graphics workstation. The system contained a series of standard text menus and associated data screens that had been implemented without graphics to spare the expense of developing a graphic interface. I put *HyperCard* back on my hard disk and started playing around. I copied the organization chart from the Card Ideas stack; made a few changes; created a few links; and within a week had a graphic, interactive prototype with the same functionality as the text menus I had seen on the GPX.

So although it is not an application generator, *HyperCard* could be a great interface engine. Look at how easily you can modify cards. "That looks great, but can you just add a new button over here?" "Sure, what screen do you want it to go on?" Or, "I like



that screen, but can you change the order of the fields?" "No problem. It'll just take a minute to move them." It's a manager's dream come true.

The problem with my prototype, of course, is that there are no real applications behind the interface. Fortunately, *HyperCard* contains hooks to drive applications. In fact, *HyperCard* could be used to invoke any compiled application that could be written for the Mac — or for a VAX or IBM mainframe with the right network software. Unfortunately, it can launch only one application at a time, and it doesn't stay around when it does so.

HyperCard could become the central actor in the forthcoming multitasking Apple environment, but it needs a lot of work to get there. I want to be able to do work in an invoked application, using a *HyperCard* card as the interface. I want to be able to integrate seamlessly what is done in *HyperCard* with what is done by the invoked application. I want to be able to invoke multiple applications simultaneously.

HyperCard can't come close to this right now. Part of this is the sorry state of multitasking in the Macintosh OS. But part of it is in the limitations of *HyperCard* itself.

The first problem is one that many others have complained about: the one-card limit. One of the great things about the Macintosh interface is its multiple, overlapping and resizable windows. Why are they gone in *HyperCard?* If you look at *HyperCard* as a stand-alone product — when you're in it, you're navigating stacks, but you leave it if you want to do anything else — the one-card limit might be justifiable.

But did Apple really have Bill Atkinson put all that work into a product just to have it used to create fancy user interfaces for on-line airline reservations or restaurant guides in shopping malls? Is *HyperCard* going to become the heart of the Macintosh workstation, or is it going to remain the darling of the 9-inch screen? If you imagine using *HyperCard* as an interface engine for applications that can interact with each other in a multitasking environment, the inability to have more than one card on the screen at a time is ridiculous. The second problem is where are the object-oriented graphics? Is Bill so enamored of bit maps that he couldn't bring himself to put objects in *HyperCard?* Granted, the lack of object-oriented graphics, in itself, doesn't prevent *HyperCard* from being used as an interface engine for workstation applications. But here again, it seems that Apple's primary interest is in having developers create screens with cute pictures.

As long as Apple limits its view of developers to those people who create commercial products for the general market, it will be slamming the door in its own face while trying to get a foot in the corporate door. Corporations create systems for their own internal use. Some of these systems have hundreds of workstations hanging off them. Not

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TWO BITS' WORTH

very many of those workstations are Macintoshes at the moment.

What has this got to do with bit-mapped vs. object-oriented graphics? I talked earlier about how easy it is to change a *HyperCard* interface. But I lied. It's a bear — and because of the bit-mapped graphics. People developing applications for workstations don't want to draw cute pictures. I, for example, want to draw a network — switches with lines connecting them. Bit-mapped graphics make it ten times as hard as it needs to be. Every time I want to redraw a portion of the network, I have to erase and start over. Even if I use buttons for some of my icons, I still can't select five buttons at once and resize or move them as a group. Instead I have to pixel-fidget with each one. I thought we left this stuff behind when *MacDraw* shipped.

And as I mentioned buttons, why do they all have to be rectangular? The icons can be any shape you want, but the buttons themselves, the active areas of the screen, are rectangles. I want arbitrarily shaped buttons. Take my network. I have a 45-degree line connecting two switches. I want the line to be a button. When I click on it, I want to go to a new card. I can't do it in *HyperCard*. But I'll just bet that if the program let me draw with objects, it could give me buttons in the shape of those objects' outlines.

It can't be that hard to make objects accessible in *HyperCard*. They're there already. What do you think is happening when you resize a button or a field? So how about giving this power to the rest of us? I'm willing to bet that the difficulty of drawing (more precisely, redrawing) bit-mapped graphics will be a major factor in turning people away from doing serious work with *HyperCard*. It's stopped me.

My wish list for changes and additions to *HyperCard* is much longer than this; but really, there's only one thing I hope for. That Apple doesn't shortchange this product by narrowing its target market. *HyperCard* is not really an application generator. It shouldn't try to be. It should go through the changes necessary to make it practical as a front end to any application you can dream up.



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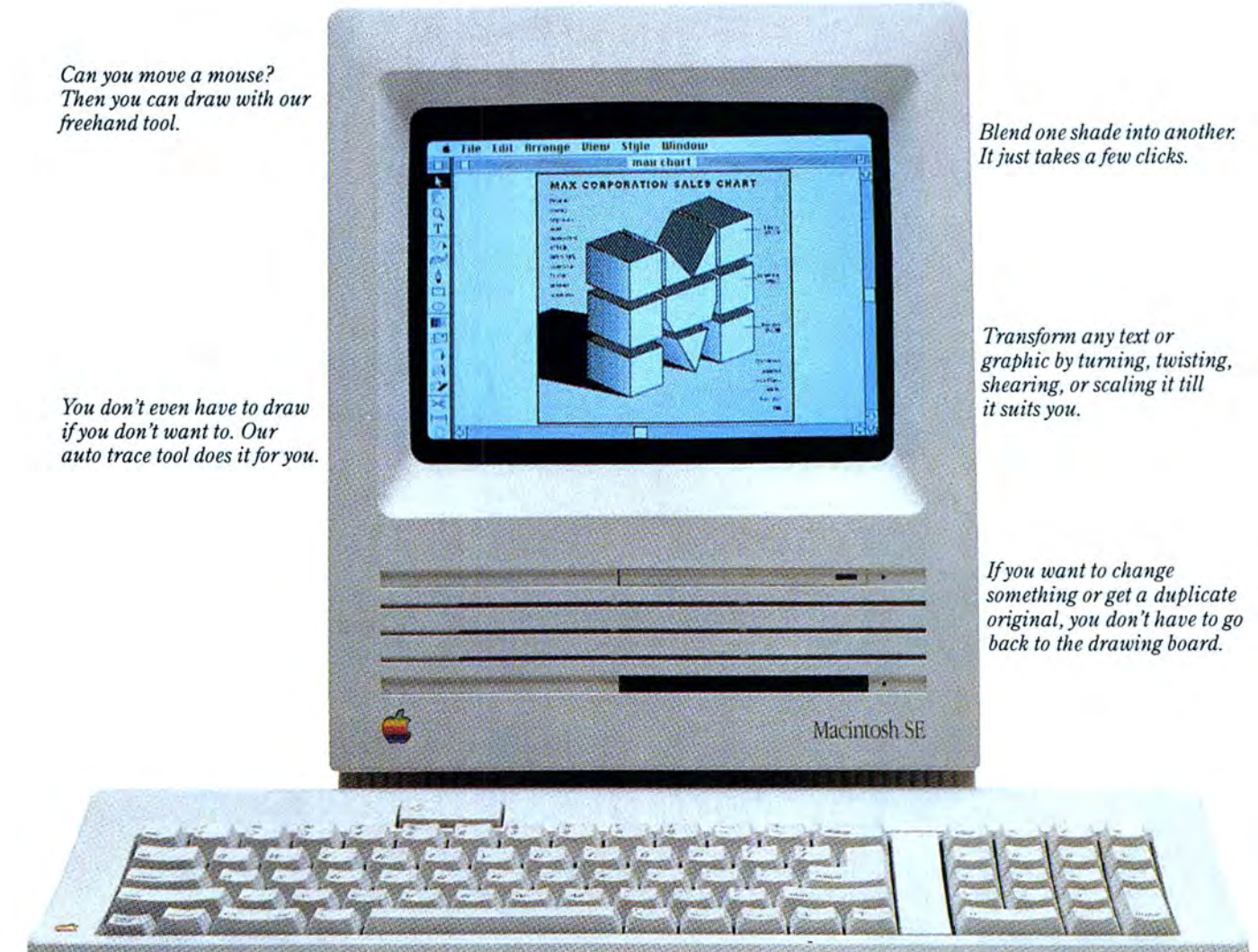
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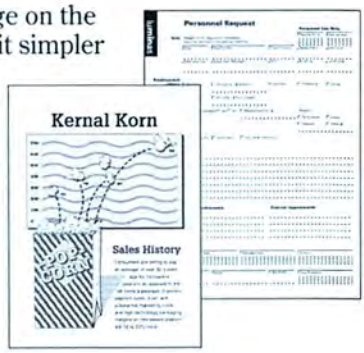
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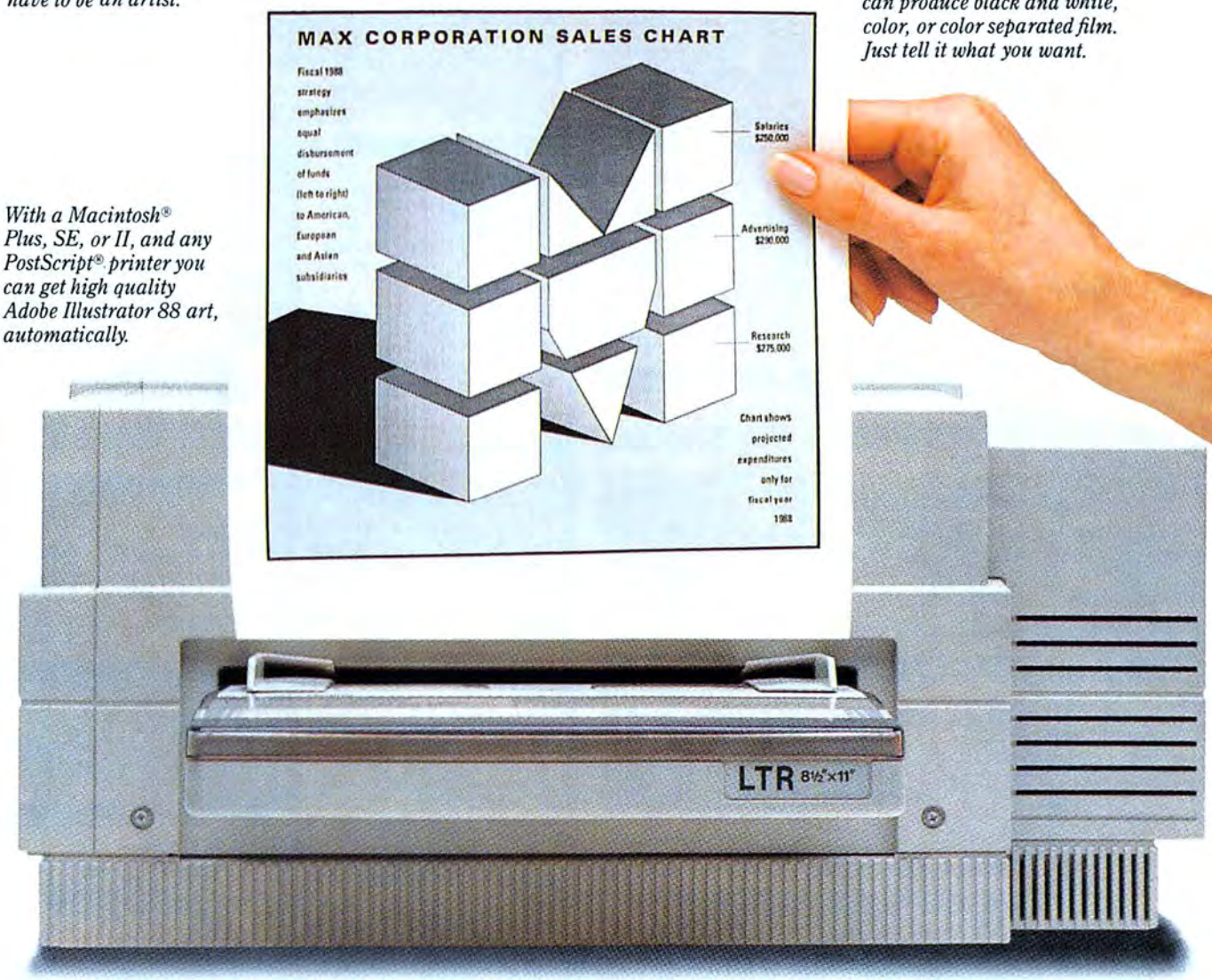
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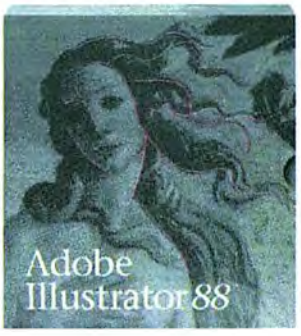
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by Michael Swaine

Adaptive Behavior

There's a fact of every programmer's life called the edit-and-test cycle. It's as familiar as breathing to the experienced software developer.

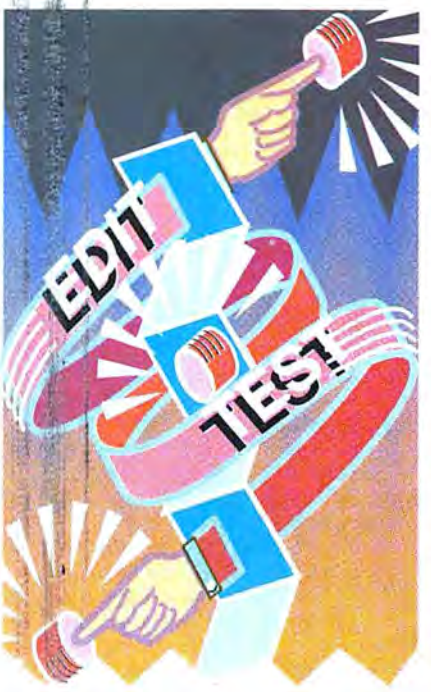
If you're a *HyperCard* user just starting to explore the capabilities of its programming language, HyperTalk, you'll come up against the edit-and-test cycle shortly after you set your user level to Scripting. You'll begin to fall into its rhythm as you (1) select the Button tool from the Tools menu, (2) select a Button, (3) select Button Info from the Objects menu, (4) select Script from the Button Info dialog box, (5) use the Script editor to make a change in the Button's script, (6) exit from the editor, (7) select the Browse tool (can't press the button while the Button tool is selected), (8) press the button to test your changes, and (1-8) do it all over again.

Every programmer wants to streamline that cycle. In HyperTalk, one way to do this is to create an Edit button.

This month I show four different scripts for such an Edit button, along the way touching on the topics of global variables and self-modifying code.

An adequate script for an Edit button would be one that asked the user for the name of the object whose script is to be edited, then invoked the HyperTalk Script editor. You can write such a script in four lines, and it can cut the steps required to invoke the editor down to clicking on a button and pressing Return, but only with an appropriate default. (The ASK command allows you to prompt the user with a default response. Press Return without typing a response and you get the default.) Adding a default leads to this month's Script 1.

When you enter an edit-and-test cycle, you set the default object, and while you're in the cycle the default will save you time because you'll be



editing the same script over and over again. When you start work on another object's script and need to change the default, you just run the edit script on itself. But it would be easier still if the default changed automatically. Isn't there some way you can make the edit script remember what happened during its last invocation?

There are two ways. A script is supposed to do the same thing every time you invoke it. To make it do otherwise, you must either alter its data or alter its code between invocations. Altering its data is easiest. Data used in a HyperTalk script is normally local. This means that the assignment of a value to a container holds only while the script is running; when the script terminates, its knowledge of such assignments evaporates. You want your script to remember a datum from one invocation to the next. You can make this happen by declaring a global variable. Script 2 shows how you do this.

Script 2 is an improvement over Script 1 because it employs an adaptive default. You don't have to edit the edit script to change its default. It has a drawback, however. Not only will the value placed in targetObject persist between invocations of the edit script but it will also be available to other scripts that might include it in a global declaration. This means that another script could change the value you wanted your edit script to remember. The risk of your accidentally reusing a name in another script may be slim, but this case exemplifies the danger of using global variables: The behavior of your script is subject to external conditions beyond its control or knowledge.

An alternative to changing the edit script's data between invocations is to change the script itself — more precisely, to make the script change itself. Scripts that do this are said to employ self-modifying code.

Here's how it works in the case of the edit script. You put the script of the Edit button into a container, engage in the usual dialog with the user, and put the result of that dialog into the appropriate line of the container. Then you dump the container back into the edit script. (Note: This is not the copy of the edit script that you are at that moment editing with, and your changes will not take effect until the next time you invoke the edit script. But that's just what you want.)

Script 3 avoids the danger of global variables, but it uses the controversial technique of self-modifying code. Some say that self-modifying code is too tricky and dangerous to put in the hands of beginners. I can't agree. In fact, some programming languages depend on the use of self-modifying code. Used carefully, it can be a powerful technique. Script 3 is not an example of careful use, though, so I have

included Script 4, which is a little more controlled. In it, I search for the line to be modified and inform the user if it is missing. This is the Edit button script I use.

Incidentally, the process I just went through, of refining Script 1 into Script 4, is a case study in the edit-and-test cycle. I hope it was useful.

Last month I asked readers to find the "hidden" program in Dan Winkler's *HyperCalc*, a simple spreadsheetlike stack supplied with *HyperCard*. There certainly appears to be something hidden because the program does a number of *Excel*-like things in only 19 lines of code. In fact, most of these lines have nothing to do with spreadsheet functions, so the search narrows quickly to one little loop in the background script. This loop, reproduced here in its entirety as Script 5, seems merely to copy some information from one line to another in a field. It's the third line of the loop that holds the key. The expression "the value of it" causes the formula stored in line 3 of the field to be evaluated. You could say that Winkler has hidden part of the program in the term "value" and part in the fields as executable data.

Here's a challenge for the coming month. If you create an Edit button and find it useful, find a way to make such an Edit button automatically available on every card in every stack you have or will create.

> Some say that self-modifying code is too tricky and dangerous to put in the hands of beginners. I can't agree. Used carefully, it can be a powerful technique.

Script 1: A simple edit button script

```
-- This handler invokes the script editor
-- on the script of a user-specified object.

on mouseUp
  ask "Edit the script of..." with "card button 1"
  if it is not empty then edit script of it
end mouseUp
```

Script 2: An edit button script that remembers

```
-- This handler invokes the script editor
-- on the script of a user-specified object.
-- It uses a global variable to save the last-specified
object.

on mouseUp
  -- The following line declares the global variable.
  global targetObject
  if targetObject is empty then put "card button 1" into
targetObject
  ask "Edit the script of..." with targetObject
  if it is not empty then
    -- Save the user's choice for the next time.
    put it into targetObject
    edit script of targetObject
  end if
end mouseUp
```

Script 3: A self-modifying edit button script

```
-- This handler invokes the script editor
-- on the script of a user-specified object.
-- It uses self-modifying code rather than a global
variable.
-- Don't use this version; it's too risky.

on mouseUp
  -- The following line is part of the self-modifying
code.
  put the script of me into thisScript
  ask "Edit the script of..." with "card button edit3"
  if it is not empty then
    put it into targetObject
    -- The next line is part of the risky self-modifying
code.
    -- Add a comment to the beginning of the script,
    -- and this line will create a self-modifying monster.
    put "ask " &quote &"Edit the script of..." &quote &"
with " &quote &targetObject &quote into line 8 of
thisScript
```

```
    -- The next line is part of the self-modifying code.
    set the script of me to thisScript
    edit script of targetObject
  end if
end mouseUp
```

Script 4: A robust self-modifying edit button script

```
-- This handler invokes the script editor
-- on the script of a user-specified object.
-- It uses self-modifying code rather than a global
-- variable.

on mouseUp
  -- The following line is part of the self-modifying
code.
  put the script of me into thisScript
  ask "Edit the script of..." with "card button 1"
  if it is not empty then
    put it into targetObject
    -- The main self-modifying block begins here.
    -- It searches for the line to modify,
    -- then modifies it or signals an error.
    put false into foundLine
    put 0 into lineNo
    repeat until foundLine
      put lineNo+1 into lineNo
      if lineNo>the number of lines of thisScript
      then
        beep 1
        put "Error in edit script."
        wait 100
        edit thisScript
      else
        if word 1 of line lineNo of thisScript="ask" then
          put "ask " &quote &"Edit the script of..."¬
          &quote &" with " &quote &targetObject &quote¬
          into line lineNo of thisScript
          put true into foundLine
        end if
      end if
    end repeat
    set the script of me to thisScript
    -- The main self-modifying block ends here.
    edit script of targetObject
  end if
end mouseUp
```

Script 5: The "hidden" program in Dan Winkler's HyperCalc

```
 repeat with i = 1 to the number of fields
    get line 3 of field i
    if it is not empty then put the value of it into line¬
    2 of field i
  end repeat
```


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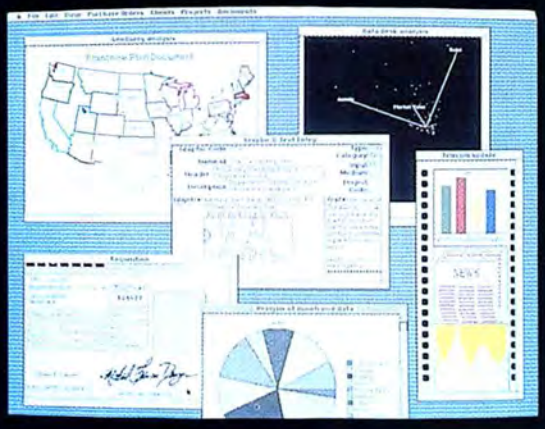
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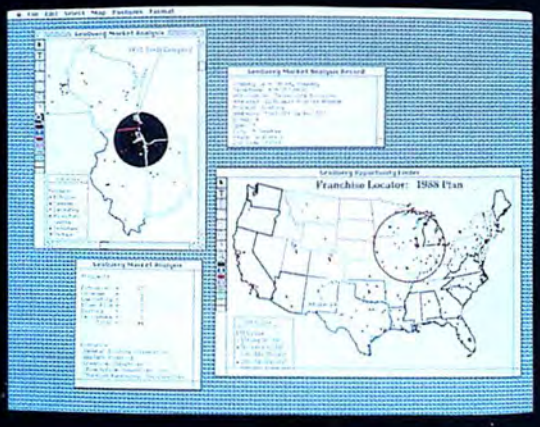
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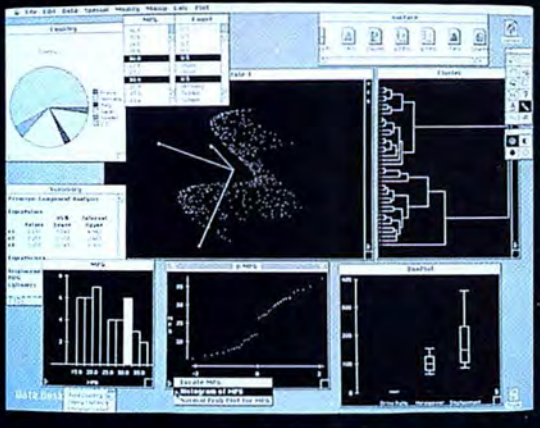
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BY CHRIS ESPINOSA

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Send your questions to Chris care of MacUser, *950 Tower Lane, 18th floor, Foster City, CA 94404. Chris will read all your questions, but unfortunately, he may not be able to answer individual queries.*

BIG MAC 512KE

Q. In the March '88 issue of *MacUser*, you answered several questions concerning the preferred way to upgrade Mac 128Ks, 512Ks, and 512KEs. You stated that the preferred way should be to upgrade to a Mac Plus and then add more memory. What problems may occur because I chose just to upgrade my 512KE to 2 megabytes without making my machine a Mac Plus first?

What is the difference between free memory and RAM disks? When I bought my memory expansion, it came with a RAM disk, and I have no idea how it can help me and the documentation is really of no help. Also, if an application is not HFS-compatible, what will happen if that application is run under an HFS system?

BRUCE BAIR
MESA, AZ

A. You'll have no problems with your 2-megabyte 512KE; it's now just a big Mac Plus without the SCSI interface. You'll miss out on hard drives and other peripherals that require SCSI (such as the new Apple LaserWriter II SC), but you could add a SCSI adapter upgrade (such as those available from SuperMac Technologies, Dove, and Peripheral Land).

A RAM disk is simply system software that uses part of your system random-access memory as a fast but small disk drive. RAM disks were popular when hard disks were rare and expensive and most applications ran in 128K of memory; they were a way to make "all that extra memory" useful. The RAM cache (built into *System,* Versions 3.0 and later) performs a similar function but more efficiently and with less maintenance. And with the current crop of applications and *MultiFinder,* 2 megabytes just doesn't seem like all that much memory anymore.

Applications that are not HFS-compatible generally won't be able to open or save documents stored inside folders on a disk, though they should be able to open and save documents at the root level (that is, in the window of the disk icon itself, outside of folders).

WHAT'S IN THE SE ROMS?

Q. I have noticed in several articles that the Macintosh SE is said to have 256K ROMs. What never seems to be mentioned is how these ROMs differ from the 128K ROMs in the Macintosh Plus. I have managed to find the hidden "slideshow," but what besides this (which seems to be a waste of ROM) do the SE ROMs contain?

PAUL WHITELOCK
DENVER, CO

A. The 256K ROMs contain everything the 128K ROMs in the Mac Plus do but with several improved versions of the User Interface, Toolbox, and Operating System Managers; some previously RAM-based Managers moved into ROM and include some completely new features. The new Sound Manager makes complete use of the digital sound chip in the SE. The Menu Manager has been expanded to support hierarchical, scrolling, and pop-up menus. The TextEdit package now supports interline font, size, and style changes. A new Script Manager has been included that supports non-Roman character sets such as Kanji and Arabic. The complete contents of the SE ROM and how to use it are described in *Inside Macintosh, Volume V,* published by Addison-Wesley.

All this adds up to less than 256K, as you've noticed, but it's bigger than 128K, and ROMs just don't come in in-between sizes. But though your ROMS may seem underused now, the extra space just might come in handy in case Apple ever does a ROM upgrade. Such "slop space" sometimes makes the difference between a cheap ROM upgrade and an expensive logic-board upgrade.

THIN IS IN

Q. Is it possible to hook up the old 512K keyboard (without numeric keypad) to an SE? I find the width of the SE keyboard seriously interferes with using the mouse conveniently. I want to replace my 512KE at home with an SE, and because the keyboard is optional, I'd like to get one as small as the original.

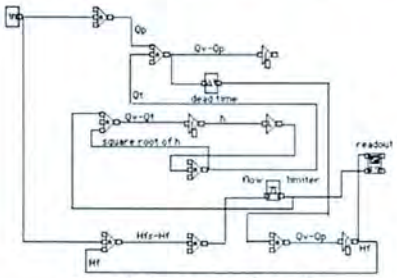
ELIOT FRIEDSON
NEW YORK, NY

A. I don't know of any way to attach an old-style keyboard to a Mac SE or II (those now use ADB, the Apple Desktop Bus, to connect the keyboard and mouse). But if you like compact keyboards, the keyboard from the Apple IIGS works just fine on the Macintosh SE and II. Your dealer may be

Users put the DESIGN in DesignScope

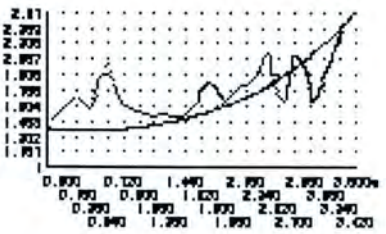
DesignScope, BrainPower's electronic system simulator, is enjoying a spring-like rebirth. No, we haven't changed it– ***you*** have. Thanks to you, the innovative electronic design tool is now modeling systems for the likes of stock analysts, psychologists, and mechanical engineers.

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capacitance tank with orifice

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theoretical vs. historical sales data

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DesignScope requires at least 512K RAM and lists for $249.95. Demo disks $10.00.



The Rest of Us...or the BEST of Us?

Anyone who has been using the Macintosh over the last eighteen months is aware of the incredible growth in both the power and complexity of the hardware, software and peripherals which have appeared. Connectivity, LAN's, A/UX, color capabilities, 2nd generation Laser printer hardware, the transputer, and multi-gigabyte data storage have all come to fruition in this incredibly short period of time. Two of the original models have completely disappeared and soon the ubiquitous Mac Plus will also be put to rest in the silicon graveyard.

Remember when you could open a new piece of software, pop in the disk and perform every function without so much as a glance at the documentation? Try that now and see how far you get. Multi-diskette systems coupled with thousand page manuals, accompanied by video training tapes no longer come as any surprise.

Getting all of this computer muscle to work as intended demands rigorous skill, discipline, and a passion for excellence from the manufacturer to the end-user. The "computer for the rest of us," has become the computer for only the best of us.

Unfortunately, we have also witnessed some horrendous failures: defects in ROM's; bug-ridden system software; the word processor that never happened; the database which, after several minutes of suspense, froze with an "Out of Memory" message; and the documentation that was strictly award winning fantasy.

Over the past few months I have portrayed some of the problems in this industry. As consumers, we can do little to change these problems directly. Perhaps the most we can do is continue to communicate our demand for excellence to the companies who provide us this wondrous technology. This is what helps keep all of us producing our best work.

I will not be writing these commentaries in our ads for the next three months as we take time out to introduce ArchiText. For those who plan to attend MacWorld Boston in August, I'll look forward to meeting you there. In the meantime, have your BEST summer to date!

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able to order one as a service item, or you could trade your keypad-endowed keyboard with a GS owner.

A CONNECTION FOR LIBRARIANS

Q. Here's some useful information for those interested in using the Mac in a library setting, such as Father John-Julian, whose letter appeared in the February issue of *MacUser*. One of the more helpful sources for anyone using an Apple in a library is the *Apple Library Users' Group Newsletter*, a free quarterly published by Apple. It's more than a newsletter — the latest issue was 78 pages long. It contains articles, reviews, and a question/answer column written by users. It also publishes a template exchange listing of templates for library applications, *HyperCard* stacks, and so on for specific library purchases.

CHERYL PENCE
SPRINGFIELD, IL

A. Monica Ertel of the Apple Library says that more than 1000 people subscribe to the *Apple Library Users' Group Newsletter* and the library welcomes more. It covers topics of interests to municipal, school, academic, and corporate libraries, and it covers both the Apple II and Macintosh computers. Subscriptions are free; write to Monica Ertel, Apple Computer, 20505 Mariani Avenue, MS 8-C, Cupertino, CA 95014.

HARD-DRIVE BLUES

Q. I have a Macintosh Plus with a MegaDrive from Jasmine. The *System* version is 4.1 (localized to German), and the *Finder* version is 5.5. My problem involves a copy of *StatView 512+* on the MegaDrive. After some time, this copy got spoiled (I don't know why — it's the only application on the MegaDrive to which this happened). I removed the entire *StatView* folder from the disk and tried to copy it once more — both from the original disk and from a working copy. *StatView* could not be copied, though the file appeared for a couple of seconds in the file listing of the MegaDrive. Can you help me or give me a hint as to what might be the reason for this strange behavior?

EDGAR HAEGELE
TUTZING, WEST GERMANY

A. Sounds like you have a bad block on your hard disk. Here's what happens: Your hard disk is divided into thousands of 512-byte blocks; a file consists of a collection of these blocks. A tiny bit of the recording surface in one block flakes off or wears down. Information previously stored in that block is lost. The file that block belonged to is then unreadable; it's no good unless every single byte is present. That's how your copy "got spoiled."

When you remove the files, the Macintosh frees up all the blocks associated with those files. Then when you try to store information back on the hard disk, it usually rerecords information over the recently freed-up blocks. Of course, when it tries to verify the recorded files, it runs into the bad block again and says the file is bad! If you remove an entire folder and replace it with an identical copy, then the files are removed and restored in the same order, so coincidentally the same file is bad the second time.

Use one of the utilities that reduce disk fragmentation (such as *DiskExpress* from ALSoft or *MacZap* from Micro Analyst — see "MiniFinders," this issue). They'll rearrange the files on your disk, usually neatly avoiding the bad block, and let you save your application on the hard disk again.

VERSION-NUMBER PLEA OF THE MONTH

Q. Help! I'm lost in the *System* maze! I have a 512KE and can't get a straight answer from anybody on what the optimum System Tools versions are for my Mac. Apple gave me System Tools with *System* 3.2 and *Finder* 5.3 when the ROM upgrade came last week. Someone told me Apple advises against using *System* 3.2 "on a daily basis" (whatever that means). My friendly Apple dealer says that later versions are too big for my measly 512K RAM. What's a Mac Mother to do?

DALE DOGGETT
INDIANAPOLIS, IN

A. *System*, Version 3.2, and *Finder*, Version 5.3, are the best versions to use, day in and day out, on your 512KE. If you're using *AppleShare*, use 3.3 and 5.4. Later versions, such as *System* 4.0 and *Finder* 5.5, will stretch the limits of RAM and perhaps deny certain applications the space they need; *System* 4.1 and *Finder* 6.0 (with *MultiFinder*) cramp a 512KE, allowing only the most compact applications (i.e., only those written for a 128K Mac) to run.

MYSTERIOUS DISAPPEARING IMAGEWRITER FILE

Q. Several times a month, I seem to experience the same problem and my local dealer is unable to help. I have a 512KE and use *MacWrite* most of the time. I am using *System* 3.2 *and Finder* 5.3.

When I come in on Monday morning and try to print a *MacWrite* document, I get a box saying that there is no printing device in *MacWrite*. If I select Chooser, the box says that there is nothing to choose.

There is no problem if I use my backup copy and copy the ImageWriter icon back into *System* — everything works OK. But what happens to the ImageWriter driver over the weekend? I do take the Mac home and use it there without the printer, but normally I don't use *MacWrite* at home.

JOHN LINDGREN
ST. SIMONS ISLAND, GA

A. Gee, this one is stumping the panel. A search of our technical-support database and our bug-report history didn't turn up any cases of printer drivers disappearing of their own volition. Try using the Chooser from the *Finder* first thing Monday morning, before you open *MacWrite*, and make sure the ImageWriter driver is present and accounted for.

HARD-DISK SHRINKAGE

Q. I bought my Mac SE nine months ago and formatted the internal 20-megabyte hard disk with *HD SC Setup*, Version 1.1. A few days ago, I initialized it again with the

Macintosh Software,

The MAC ZONE



Eddy Award winning **Spellswell** is a powerful spelling checker, proofreader and dictionary, while **Lookup** is a single word spell checker designed to work in any Mac program and **Findswell** a document finder and opener. All *Working Software* products have earned a five mouse rating from MacUser. **Findswell, Lookup each $30., Spellswell $42.**

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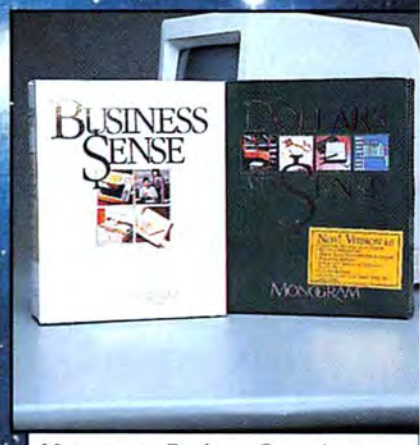
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G.R.S.
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TECH TIPS From Uncle Dennis

Dennis Wilkins,
MacZone Technical Advisor

Keep Your Mac Cool!

With Summer near at hand, keeping cool is on everyone's mind. If your Mac does not now have a fan, consider such a purchase a wise precaution. Until you do get a fan here are some basic tips to keep your Mac cool. Do not block the air vents located on the sides and top. I frequently see people place file folders and books against the Mac and set papers on top of it. Try to keep your Mac in a cool area where there is air circulation. If you have a portable fan, share the breeze with your Mac. You will both feel better because of it.

(For more Tech Tips from Uncle Dennis ask for The MacZone Magazine with your next purchase)

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Pro 140 II/I 1295.
Tapestack 60 Meg Scsi 725.
Datadesk
Mac 101 Keyboard(512k,Plus) 139.
Mac 101 Keyboard(Mac II) 145.
Mac 101 Keyboard(SE) 139.
Dove - Macsnap Products
524e (512ke To 1meg) 155.
524s (512ke To 1meg with SCSI port) .. 229.
548e (512ke To 2meg) 395.
548s (512ke To 2meg with SCSI port) .. 465.
115 (128k To 1meg) 299.
2SE 325.
524 (512k To 1meg) 179.
548 (512k To 2meg) 369.
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Scsi Port Adapter 110.
Hayes
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U.S. Robotics
1200 Baud Modem 199.
2400 Baud Modem 359.
9600 Hst Baud Modem 699.
Videx
Bar Code Labeler 72.
Timewand Manager 398.

Languages

Borland
Turbo Pascal 59.
Mainstay
V.I.P. 79.
Microsoft
Basic Interpreter 3.0 86.
Paragon Courseware
Qued 54.
Qued-M 99.
Think Technologies Inc.
Lightspeed C 104.
Lightspeed Pascal 75.
Tml Systems
Tml Data Base Tool Kit 59.
Tml Pascal V2.5 69.
Tml Source Code Library 55.
True Basic
True Basic 59.
Zedcor Inc
Z Basic 4.0 69.

Music

Ars Nova
Practica Musica 1.5 94.
Broderbund
Jam Session 30.
Bogas Productions
Studio Session 50.
Great Wave Software
Concertware + 4.0 40.
Concertware + Midi 4.0 90.
Impulse
Audio Digitizer 106.
Mark Of The Unicorn
Professional Composer 395.
Professional Performer 325.
Passport Designs
Master Tracks Pro 2.0 251.
Passport Midi Interface 97
Resonate
Listen 65.

Utilities

Affinity
Tempo V1.2 52.
Alsoft
Disk Express 32.
Font/Da Juggler Plus 38.
CE Software
Calendarmaker Ver. 3.0 29.
Disktop Ver. 3.02 + ... 35.
Quick Keys Ver. 1.1 69.
Central Point Software
Copy II Mac 23.
Centram Systems West
Tops (For The IBM) 292.
Tops (For The Mac) 129.
Farallon
Phonenet 39.
Fifth Generation
Fast Back 60.
Greene Inc
Quick Dex 24.
Imagine Software
Smart Alarms 36.
Living Videotext
More 1.1c W/Acta 165.
Mac Master
Fedit + Version 1.07 28.
Fedit + 2.0 35.
Mainstay
Think N Time 59.
Typenow 27.
Micro Analyst
Maczap & Disk Clinic 5.0 45.
Meta
Design 2.0 220.
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Turbo Net 30.
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Symmetry
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Inbox Personal Connection 75.
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Beck Tech
Fanny Mac 65.
Datadesk
Hyper Dialer 29.
Ergotron
Mactilt,MacPlus/SE 72.
Mouse Cleaner 360° 12.
Golden Ribbons
Black 4.
Blue,Red,Brown,Green 6.
Multi Colored 16.
Kalmar Designs - Disk File Cabinet
(Holds 45 Disks) 19.
(Holds 90 Disks) 29.
Kensington Microware
Mactilt 23.
Mac Disk Drive Clean Kit 19.
Printer Muffler 43.
Mouse Clean Kit & Pocket 16.
Polarizing Filter 35.
System Saver Mac Fan 64.
Turbo Mouse (128k/512kPlus/SE/II) 88.
Kraft
Joystick (Quickstick) 38.
Mac Packs - Gray,Navy,Wine
Imagewriter Bag 45.
Mac Plus/SE Bag 62.
Mac SE Bag *Xt -Navy 72.
MSC Technologies
A+ Mouse Adb (SE Or Mac II) 85.
A+ Mouse (512 And Plus) 65.
Saving Zone
800k Disk Drive (Platinum) ... 189.
6 Outlet Noise & Surge Protector 24.
Mouse Pad -Blue,Grey,Red 6.
Tool Kit To Open Mac 20.
Scancofurn
Mac Table 375.
Sensible Softworks
Bags available inGrey,Navy &Wine
Imagewriter I&II Bag 45.
Mac 512/Plus/SE Bag 50.
Smith & Bellows
Diskette Chest - (Holds 96 Disks) 27.
Sony
Double Sided Disks-10 Pack 21.
Double Sided Disks-Bulk each 1.45
Single Sided Disks-10 Pack 14.
Single Sided Disks-Bulk each 1.20
Symmetry
Hyper Da 38.

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4th Dimension 549.
Activision
Focal Point 59.
Aegis Development
Doug Clapp'S Word Tools 45.
Alp Systems
Mac Proof V. 3.0 119.
Ashton Tate
Full Write Professional 225.
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Blyth Software
Omnis 3+ 3.25 & Express 288.
Bootware Software
Resume Writer 60.
Borland
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Statview 512+ 178.
Bravo
Mac Calc 79.
Chang Labs
C.A.T. 227.
Compuserve
Compuserve Starter Kit 25.
Cricket Software
Cricket Graph 124.
Data Tailor Inc.
Trapeze 2.0 215.
Dataviz
Mac Link Plus W/Cable 134.
Deneba Software
Coach Professional 109.
Coach Thesaurus 36.
Electronic Arts
Thunder 1.1 32.
Freesoft
Red Ryder 10.3 58.
Jam Software
Maclist 75.
Legisoft/Nolo Press
Will Maker (Formerly Will Writer) 30.
Lundeen & Associates
Works Plus Command 62.
Works Plus Spell 1.1 47.
Micro Lytics
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Migent
In House Accountant 120.
Monogram
Business Sense 262.
Nashoba Systems
Filemaker Plus 195.
Odesta
Double Helix Release 2 CALL
Select Micro Systems
Map Maker 3.0 221.
Software Discoveries
Record Holder Plus 44.
Software Ventures
Microphone CALL
Survivor Software
Mac Money V. 3.0 64.
T/Maker
Write Now 99.
Wordperfect Corp.
Wordperfect CALL
Working Software
Lookup (Requires Spellswell) 30.
Spellswell 42.
Spellswell Legal & Medical Dict. .. 57.

Graphics & Design

3g Graphics
Impact-Graphics And Symbols 1 60.
Adobe
Illustrator 1.1 425.
Aldus
Pagemaker 2.0a 445.
Freehand 445.
Altsys
Fontographer 239.
Brainpower
Design Scope 1.15 128.
Graphidex 75.
Broderbund
Print Shop 39.
Cricket Software
Cricket Draw 174.
Pict-O-Graph 108.
Deneba Software
Canvas 117.
Diehl-Graphsoft
Minicad 3.15 398.
Dubl-Click Software
Wetpaint, Vol 1 & 2 35.
World Class Fonts, Vol 1 & 2 ... 35.
Foundation Publications
Comic People (Vol.1 Office Days) 25.
Comic Strip Factory 35.
Innovative Data Design
MacDraft CALL
Letraset
Ready Set Go 4.0 289.
Macromind
Video Works II 117.
Postcraft International
Laser Fx 117.
Shana Enterprises
Fast Forms Construction Kit 79.
Silicon Beach Software
Silicon Press 46.
Super Paint 79.
Solutions
Glue,Smartscrap & Clipper 39.
Super Glue 52.
The Curator 82.
Strider Software
Poster Maker Plus 39.
Supermac Software
Pixel Paint 289.
T/Maker
Click Art Business Images 29.
Click Art Christian Images 35.
Target Software
Scoop 299.

Creative Education

Bible Research Systems
The Word 169.
Borland
Eureka: The Solver 129.
Bright Star Technology
Alphabet Blocks 31.
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Math Blaster 28.
Speed Reader II 38.
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Microsoft
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Mindscape
Balance Of Power,
CrosswordMagic,DejaVu,
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new version, 1.5. But now I have 846K less memory available. Can you tell me why? That's quite an amount, I think. I would like to know if I could initialize my hard disk with the earlier version and just update the driver regularly. Is there a reason not to do so?

GARY CZYCHI
ST. GALLEN, SWITZERLAND

A. Apple uses several different makes of disk drive in its Macintosh SE. Although drive manufacturers all claim to deliver 20 megabytes, none holds exactly that much, and they vary from each other by nearly 1 megabyte. Earlier versions of *HD SC Setup* used all available blocks on a hard disk. But some users found that mirror-image backups made on one hard disk couldn't be read on another because of different actual drive capacity. That's a problem — suppose your hard disk broke and you got a new one installed, and you couldn't restore from your carefully made tape backup because the disk was a different size. So *HD SC Setup,* Versions 1.3 and later, always initialize a 20-megabyte hard disk with 40,000 blocks, or 19.53 megabytes, of user space and reserve whatever's remaining for partition tables, drivers, and other things.

Because your hard disk did work when initialized with *HD SC Setup,* Version 1.1, you could reinitialize with that version and its driver and get your 846K back (after, of course, backing up all your files). There shouldn't be any problem using a drive formatted for that size, except that mirror back-ups made of that drive might be worthless if your hard disk crashes and is replaced with a different unit. Not all SEs work with that version of *HD SC Setup;* Version 1.3 or earlier won't work with Macintosh SEs whose serial numbers begin with F721 or later.

IMAGEWRITER COMPLAINT OF THE MONTH

Q. **My ImageWriter I has served me well and faithfully since 1984, enduring long printing sessions and a 3-foot drop to the floor without complaint. It's beginning to show its age, however, in the form of an extremely slippery roller and poor horizontal alignment. The roller assembly seems to have excessive side-to-side play, almost ⅛ inch, and the rubber has become hard and glazed.**

I realize that it might be cheaper in the long run to scrap Old Faithful rather than pay a shop to repair it, but I can perform the repairs myself (having taken the roller out previously to extricate some gummed labels). My question is: Where can I get a replacement roller assembly, and how much will it cost?

SCOTT EDWARDS
SIERRA VISTA, AZ

A. Try asking your dealer for service part 970-0068, which is the ImageWriter I platen roller. Dealers set their own prices for service parts and have their own policies on do-it-yourself work, so shop around for the best deal. That'll freshen up your roller, though I don't know whether it will stop the side-to-side play; that depends on whether the wear is on the roller bearings or their bushings.

If roller slip and play are your problem, try using pin-feed paper; several paper manufacturers now supply continuous-form, pin-feed paper in premium weights and textures, with clean-perforated edges. It's hard to tell that it wasn't sheet-fed, and it's a lot more convenient.

IS SWITCHER USEFUL ANYMORE?

Q. **Danny Goodman's *The Complete HyperCard Handbook* discusses using *HyperCard* with *Switcher.***

Sadly, this information appears to be far out of date. For example, *HyperCard* cannot live in a 700K partition but requires 782K. Even more significant, the *Switcher* program (Version 5.1) overhead is 225K, leaving a paltry 17K for any other application on a 1-megabyte machine.

With the advent of *MultiFinder,* is *Switcher* obsolete? It seems that the one area in which *Switcher* might still be valuable is in its low overhead on a 1-megabyte Mac.

In the *MultiFinder* environment, my *System* and *Finder* consume a total of 426K. And when I load *MacWrite* into a 256K partition, the *System* partition increases by 10K. Of course, if *Finder* is loaded under *Switcher,* the difference becomes smaller, but under *Switcher* there are much more compact alternatives to *Finder,* whereas under *MultiFinder* it does not appear to be possible to omit *Finder.*

Is this essentially correct, or am I missing a vital factor? These numbers seem to indicate that *Switcher* offers some useful combinations that are just not possible on a 1-megabyte Mac under *MultiFinder.*

VANYA MATZEK
CUPERTINO, CA

A. You've noticed two things: one, that Switcher has less overhead than *MultiFinder* does, especially because *Finder* is optional; and two, that with large applications such as *HyperCard* or *PageMaker,* it doesn't matter much. Yes, you can run three 128K applications under *Switcher* whereas you can only run two under *MultiFinder,* but as the average Macintosh memory size creeps toward 1 megabyte, you'll find fewer and fewer applications that can run successfully in a 128K partition anymore, under either *Switcher* or *MultiFinder.* So *Switcher* is still useful for using earlier applications on a 512K or 1-megabyte machine, and *MultiFinder* is more useful for using newer applications on 1-megabyte machines and up.

LOOKING FOR A FONT EDITOR

Q. **For the past few years I have enjoyed *MacUser,* my Macintosh Enhanced, and an ImageWriter I, but with the hardware, not your excellent publication, I have also endured a problem — I hope you can offer a solution.**

I use *Microsoft Word* 3.01 for a great deal of writing in which there is much call for Japanese terms transliterated into English — that is, Romanji terms. I desperately need an Option key (similar to the umlaut) that is a long mark over a letter, particularly any vowel

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THE *HELP* FOLDER

(macron), similar to the o in Romanji. Is there an easy way to change Option-i (circumflex) or Option-n (tilde), neither of which I have much reason to use, to a long-mark option?

CARL BOYD
FALLS CHURCH, VA

A. You can use a font editor, such as *FONTastic* from Altsys or the font editor in *ResEdit* from Apple (available through APDA) to create characters with a long mark over them or change the circumflex to the long mark on the vowels in which you need them.

Be aware that just changing the circumflex mark won't work; the Font manager has a separate bit image of each accented vowel in each size in each font, so you need to change every accented vowel in every size in every font you want to use. Also remember that editing bit-mapped fonts is only effective on your own Macintosh and ImageWriter; if you send a file to a friend or try to print on a LaserWriter, you'll get the original characters, not your changes.

APPLEWORKS TO MAC

Q. **I am looking for an easy way to convert *AppleWorks* files to the Macintosh.**

I have a IIc connected to my Macintosh and have successfully transferred several thousand pages of DOS 3.3 *AppleWriter II* files with no difficulty because they are not formatted for a page until the printing process.

With the *AppleWorks* program, however, the page is formatted at the time of writing and the transferred files all have a large number of carriage returns at the ends of lines that have to be removed.

This seems to be the case whether you print to disk as an ASCII file and then transfer that or simply print to the Macintosh using appropriate software. I've tried configuring special printers, all to no avail.

There must be an easier way. I've a thousand or more pages to do.

JACK MILLER
BROCK UNIVERSITY
ST. CATHERINES, ONTARIO

A. With *System*, Version 5.0, for the Macintosh, Apple introduced *Apple File Exchange*, a utility for translating files from one format to another. *AFE* can read Apple II, ProDOS-formatted, 3.5-inch disks directly into the Macintosh. If you can, get your IIc connected to an external Apple 3.5 drive and run *AppleWorks* under *ProDOS*, then simply copy the *AppleWorks* files onto that disk. Don Williams of Productivity Software (CompuServe [75016,2336]) has a translator for *Apple File Exchange* that will then convert the *AppleWorks* files directly into *Microsoft Works* files for the Macintosh.

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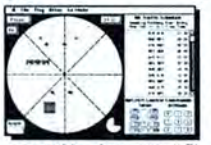
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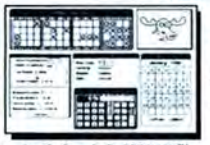
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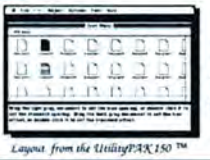
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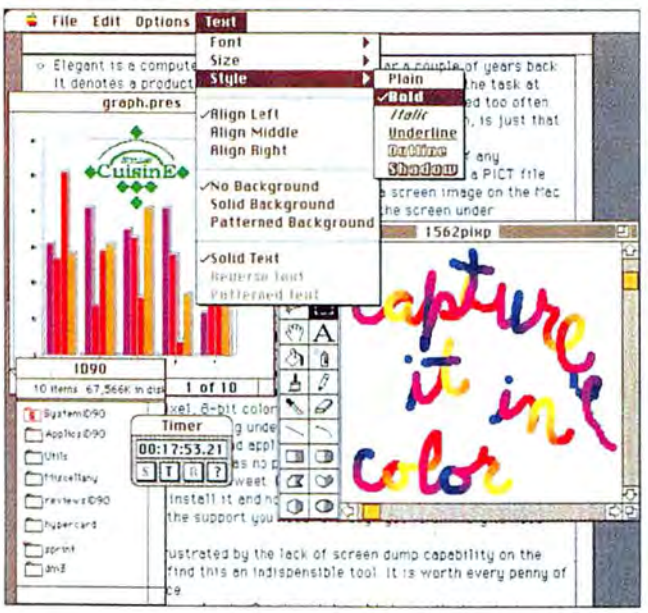
CAPTURE



Elegant is a computer buzzword that was popular a couple of years back. It denotes a product, usually software, that accomplishes the task at hand with power, grace, and simplicity. You don't hear it used too often. But *Capture*, a new screen-dump utility for the Macintosh, is just that — elegant.

What *Capture* does is simple: It lets you save any portion of a Macintosh screen to the Clipboard or as a PICT file. What *Capture* does is powerful. It duplicates a screen image on the Mac II, in color or with gray scales. It can capture desk accessories, screens with menus pulled down, and most dialog boxes. It even captures the screen with a *VideoWorks II* movie running.

To install it, you place an INIT file in your *System* folder and restart the Mac. To use it, press Command-Shift-C. A small cross-hair cursor appears. Drag it over the portion of the screen you want to capture. That's it.



Normally the image will be saved to the Clipboard. If you hold down the Option key while you drag, it saves the screen as a PICT file in the root directory of your *System* disk. On a Mac II, it'll save in color as a PICT 2 document; the format is old-style PICT for the SE, Plus, and 512KE.

Capture uses up a bit of memory. If you're capturing a 1024-X-1024-pixel, 8-bit color image, you could need as much as 1 megabyte. And that's to save to a file. Saving to the Clipboard takes twice as much memory. If you're running under *MultiFinder*, the memory *Capture* works with has to be available in the foreground application. Bit-mapped compression schemes built into the Mac ROMs usually reduce this significantly, however. I have found that under most circumstances, *Capture* has no problem doing its job.

There are some problems importing *Capture*'s images into other applications. Because *Capture* is based on the new ROMs and new PICT definitions, some earlier applications, such as *MacDraw* (1.9.5) and *SuperPaint*, have trouble with *Capture*-generated bit maps.

I have only two complaints. First, I wish I could change the keystroke combination that invokes *Capture* to one of my own choosing. Command-Shift-C is used by *Word* and *PageMaker* for centering text — I can't even fix the conflict with *QuicKeys*. Mainstay says that *Capture* works at too low a level to be user-configurable but plans in its next release to change the keystroke it uses to Command-Shift-3. Second, on those occasions when *Capture* doesn't have enough memory to do its job, I would like to see an alert message.

These problems are minor, however. If you've been frustrated by the lack of screen-dump capability on the Mac II, you'll find this an indispensable tool. It is worth every penny of its $60 list price.

Capture

List Price: $59.95.
Published By: Mainstay, 5311-B Derry Avenue, Agoura Hills, CA 91301; (818) 991-6540.
Requires: 512KE+. Mac II and *MultiFinder* friendly. Version 1.0 reviewed. Not copy protected.

— *Henry Bortman*

WORD PROCESSING

MACWRITE



MacWrite is the VW Beetle of Mac software. Like its automotive counterpart, it's easy to use and get comfortable with and it's kept its familiar look and feel through the years. But just like the Bug of the early '70s, *MacWrite* is showing its age. Version 5.0, from Claris, adds a few features, but this is still the same program.

MacWrite was designed as a basic word-processing program, and 5.0 continues that philosophy. The Ruler is still the main formatting tool, and no "power" features have been added — for instance, multicolumns are still unavailable.

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MU6

Quick Clicks

The two major additions are Command-key equivalents for most functions and a spelling checker. As for the first, key equivalents are nice, but their inclusion here is passé. Dedicated *MacWrite* users who wanted them have already either hacked them out with something such as *ResEdit* or added them with a macro program such as *QuicKeys.* Moreover, it would have been nice to have had equivalents for every command instead of for a majority.



The spelling checker is a nice feature, but only that. It's slow, awkward, and because it writes each document or selection to the Clipboard before performing the check, users with 512K RAM, large documents, or *System* files that are loaded with DAs can easily hit a memory ceiling that prevents them from checking their work. In these cases, the only solution is to check the document in sections — an annoying and cumbersome process. What's more, you have to check headers and footers separately from the document, adding one more step to the job.

The only other changes are minor, but one of them is potentially troublesome: The addition of a Case Sensitive option in the FIND, FIND NEXT, and CHANGE commands. The problem is that the default button is on, which means that if you forget to turn it off, you could miss a few of your search words — or worse yet, miss replacing them. This is a good option, but the default position should be off to prevent accidents.

A SELECT ALL command has also been added to the Edit menu, so you don't have to scroll back and forth to select a document anymore. A GO TO PAGE # command helps you navigate around large documents.

MacWrite is still a good, functional word-processing program, but its limitations mitigate against a wholehearted recommendation. Compared to the competition, notably T/Maker's *WriteNow, MacWrite* seems almost willfully underpowered. It can save only in *MacWrite* or straight-text formats, and worst of all, it still restricts you to only one open document at a time.

But for all its limitations, *MacWrite's* strengths remain formidable: It hews to the Mac interface; it's easy to learn and use; 5.0 can read documents created with earlier versions (and vice versa); and it'll probably be enough for users who only write an occasional letter, memo, or short report. Because it originally came from Apple, it also has de facto status as the standard for word-processing files.

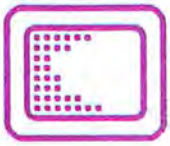
It's a measure of the marketplace, however, that consumers can rightfully expect and demand more. Just like VW in the '70s, Claris has made only cosmetic changes to a product that's remained unchanged for too long. It now faces the prospect of a major development project just to reach parity with its principal competition (*Write Now* and *MicroWrite*). Unfortunately for Claris, software doesn't have the luxury of resurrecting itself as nostalgia.

MacWrite
★★★½
List Price: $125.
Published By: Claris, 440 Clyde Avenue, Mountain View, CA 94043; (415) 960-1500.
Requires: 512KE+. Mac II and *MultiFinder* friendly. Version 5.0 reviewed. Not copy protected.

— Russell Ito

HARDWARE

CLASSIC PROFESSIONAL GRAPHICS DISPLAY



Did you buy a black-and-white monitor for your Mac II because you just couldn't justify the extra money for color? Then you should look at the Classic Professional Graphics Display for the Macintosh II, which offers color at a low cost.

The Classic Display is not a "generic" monitor, as is the NEC MultiSync. Each version is specifically tuned to be used with a specific video card, so although the Classic Display looks like an IBM PC display, this version is specifically intended for use with the Apple video card (or equivalent) for the Macintosh II.

The Classic Display is simple to set up. It comes with a power cord — although it is not compatible with the male "socket" on the back of the Mac II — and a 15-pin video cable that hooks up to the connector on the Apple video card. The display has three controls on the front: an on/off switch (with indicator light) and contrast and brightness controls.

The color reproduction of the display is good, and the image is fairly sharp and clear. On the evaluation unit I examined, 50% grays created by dithering (such as the standard desktop pattern) had a greenish tint, although blacks were black and whites were white. The unit also exhibited some pale-green narrow stripes down the left side of the screen that faded toward the center of the screen. This effect was very noticeable against white or pale backgrounds but less distracting against color backgrounds.

Overall, the Classic Display is good value for the money. Although more expensive monitors offer better reproduction with fewer flaws, the quality of the Classic is acceptable. If you're looking for a color monitor and price is a major consideration, look at the



Classic. If you're looking for a second monitor and image quality is not of paramount importance, the Classic may be what you're looking for.

Classic Professional Graphics Display
★★★½
List Price: $549.
Manufactured By: Classic Components Corporation, 1490 Artesia Boulevard, Gardena, CA 90247; (213) 217-8020.
Requires: Macintosh II and Apple video card.

— Robert R. Wiggins

QUICKSHARE

Not long ago *connectivity* was just a high-falutin word; now it's all the rage. As the Macintosh successfully integrates into IBM-dominated workplaces, there's more and more need to transfer files easily and successfully.

A product designed to do just that is *QuickShare,* a hardware-software solution that's both innovative and disappointing. The innovation comes in that it uses the Mac's SCSI port to connect to a PC, which means file transfers are very fast.

What you get is an add-in board for an IBM PC (which gives you the necessary SCSI port on the PC side), a 10-foot cable, a SCSI terminator that goes on the Mac side of the cable, software for both machines, and a very bad 60-page manual.

Compatible Systems' scenario is for an office dominated by IBMs with a minimally equipped Mac. If yours falls into this category, then you should consider *QuickShare* because it has the handy feature of being able to use the hard disk on your PC to store and run your Mac files and applications. If you already have a hard disk for your Mac, you'll need to purchase an additional cable to daisy-chain *QuickShare* to the Mac. Also, if your Mac is on a network, you may have to reset some of the DIP switches on the PC board.

Once you have it all running, you can create a virtual disk on your PC hard disk that shows up on the Mac desktop as a separate Disk icon. You can even boot your Macintosh from that disk if you move all your *System* software to it. Most people, however, need connectivity not to economize on hard-disk purchases but to transfer files. It is here that *QuickShare* shines.

Included in the package is an application called *PC Transfer* that lets you intuitively move files from the Mac to the PC and vice versa. The process is very fast. Compatible Systems claims a speed of 1400K per second on a Mac Plus — as opposed to 265K per second for its competitor, *TOPS.*

Imagine moving a *WordStar* document to the Macintosh desktop complete with a *MacWrite* icon or a *Quattro* graph appearing directly as a *MacPaint* file. You can also choose a font and font size to be used in the translation process, but such things are usually just as easy to accomplish once you open the file in *MacWrite.*

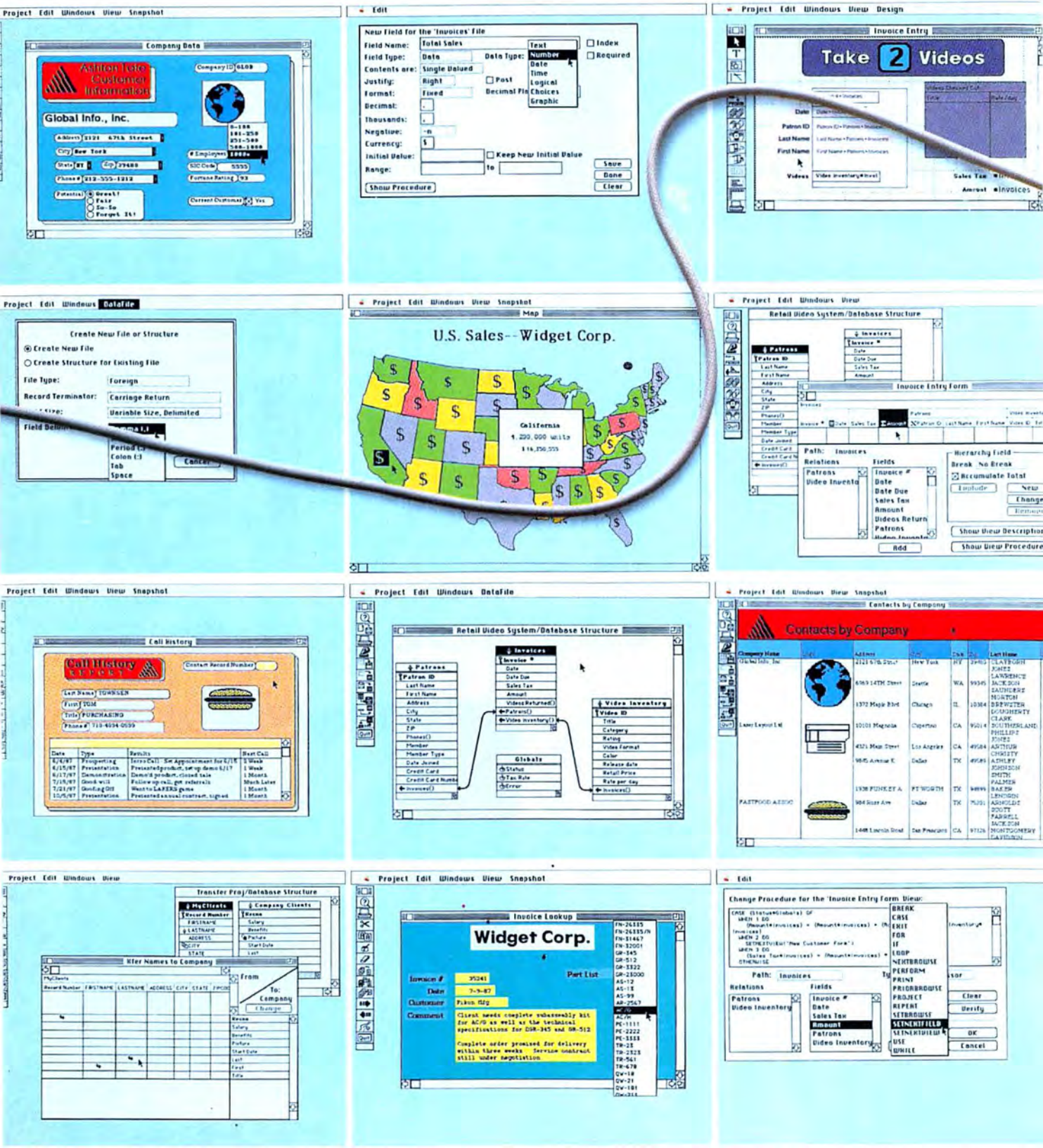
Unfortunately, *PC Transfer* lacks some niceties. You can't, for example, select by typing, as you can in normal file-selection boxes. This is a big drawback if your directory has many files. Also, the files appear with directories first, then documents, then applications — which is fine sometimes. But it would be better if you could choose to view them by name, by kind, by size, and so on, as you can from the *Finder.*

An important part of the *QuickShare* package is the RAM-resident program called *QSPC* that you run on your PC. This program looks for any IBM document being sent to your printer and lets you redirect it to a file instead. Because most PC programs are far from WYSIWYG, *QSPC* allows you to capture to file the *printed* form of PC documents instead of the preformatted form.

The only catch to using *QSPC* is that the program you're running must be set up to print to an IBM Graphics Printer in order to work. This printer was chosen on the grounds that it is the most prevalent in offices and that virtually any program can be configured to print to it. Still, the drawback is that if your programs aren't already set up for it, you'll have to create separate versions of your programs so that *QSPC* can do its thing. Perhaps the



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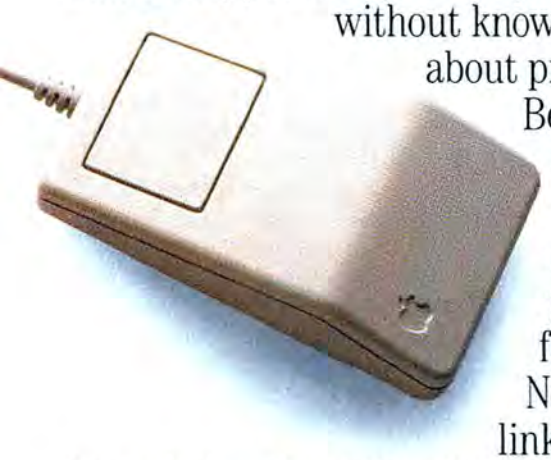


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*Hardware requirements: Macintosh Plus, Macintosh SE, Macintosh II with at least 1MB memory. †While supplies last. ††In Colorado, call (303) 799-4900, Extension 2403. Trademarks/owner: dBASE, dBASE II, dBASE III, dBASE III PLUS, Ashton-Tate/Ashton-Tate Corp.; MacDraw/Macintosh/Apple Computer Inc. ©1988 Ashton-Tate Corp. All rights reserved.

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Quick Clicks

most confusing thing about *QSPC* is that the manual describes it so poorly that for a long time I thought it only worked as a screen-dump capture program (i.e., a Shift-PrtSc utility).

Also worth mentioning is that Compatible Systems offers unbundled versions of the *QSPC* software — called *AnyText* and *AnyGraph* — for $95 each. They work in substantially the same way as *QSPC* does except that it's up to you to get the PC file moved over to the Mac (the hardware and the *PC Transfer* program are not included). You then use Apple's *File Exchange* utility (available in the latest *System* update) to translate the file to the appropriate Mac format.

QuickShare is fast but not free of problems and confusion. The manual is cryptic, and setting the product up can cause a lot of frustration. If you really need to share files and want to be able to turn your PC graphics and text into *MacPaint* and *MacWrite* documents, though, *QuickShare* works well enough.

Being able to share an IBM hard disk with your Mac is great — unless you already have a hard disk for your mac.

QuickShare

$$$

List Price: $465.
Marketed By: Compatible Systems Corporation, P.O. Drawer 17220, Boulder, CO 80308; (800) 356-0283, (303) 444-9532.
Requires: SCSI port. Mac II and *MultiFinder* friendly. Version 1.24 reviewed. Software not copy protected.

— *David Valiulis*

GRAPHICS

IMAGE STUDIO



Picture perfect. It's a simple, catchy phrase — but images usually require a good deal of effort to get them right. Achieving perfection can be expensive and time-consuming. With *Image Studio,* however, you can modify photographic pictures quickly and economically.

Image Studio brings many of the elements of a photo-retouching lab to the desktop. It lets you manipulate, enhance, retouch, and even recreate images that have been digitized. With it you can remove unwanted elements, alter contrast, lighten shadows, or apply special effects.

The program works with images as large as 17 X 17 inches and at near photographic resolutions and tonal gradations. The only constraint is available memory. When image size is set, the program calculates and displays its memory requirements. Only one document may be open at any time, but multiple views of the same file are possible on separate windows.

Image Studio supports up to 65 gray levels. On a Mac II with a gray-scale monitor, all 65 are displayed, approaching the continuous tones of photographs. On the Mac Plus and SE, on-screen gray levels are approximated by combining black-and-white pixels (dithering) to simulate grays.

In addition to its own Raster Image File Format (RIFF), *Image Studio* reads TIFF (Tagged Image File Format), *ThunderScan,* FOTO (*PageMaker* 1.2), and *MacPaint* files. (Files can be saved in RIFF, TIFF, Encapsulated PostScript [EPSF], and *MacPaint.*) With images digitized by gray-scale scanners, *Image Studio* works directly with the tonal values read by the unit. With images produced by dithering scanners, the program constructs gray values from the dither pattern. (A 4 X 4 dither matrix yields 16 gray levels.) *Image Studio* cannot impart more tones than were originally present, but once within the program, any image can be edited with the full complement of shades.

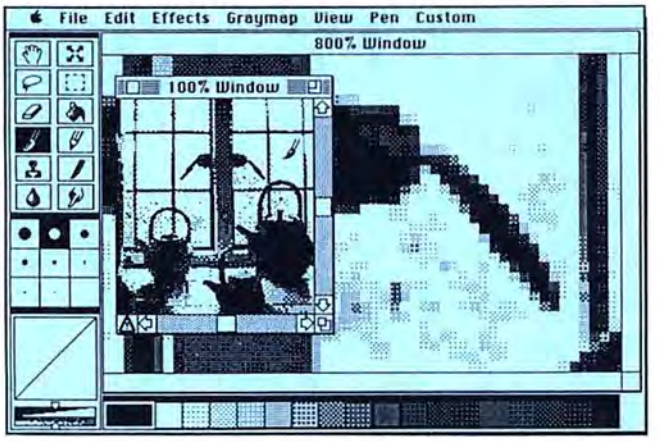


Image Studio's retouching tools are at the same time familiar (Pencil, Paint Bucket, and Paintbrush) and unusual (Rubber Stamp, Charcoal, Fingertip, and Water Drop). You can adjust every tool to suit your preferences, and you can create custom tools and pens as well.

You manipulate gray levels with the GrayMap Editor, a box that shows graphically the distribution of grays in the image. You adjust brightness and contrast using sliders. Other effects, including negative values and solarization, are possible by changing the plot of the graph itself. Further, the GrayMap menu controls the number of gray levels (Posterize) or adjusts the entire image to the values of a particular section (Equalize). *Image Studio* also incorporates Filters that produce effects such as sharpening or blurring.

If you require halftones, *Image Studio* generates them. You can define preset and custom screens (line or dot) for the entire image. The Printer's Default selection automatically produces the halftone setting of PostScript devices.

Despite its power, *Image Studio* has some limitations. There is no autoscrolling when a tool reaches the edge of a window. Thus, selection tools are limited to the area in view. Also, rotations are possible only for the entire image and only in 90° increments.

Perhaps most important is the financial limitation. *Image Studio* makes image manipulation more affordable, but that's compared to minicomputer-based systems. To use *Image Studio*'s full potential, be prepared to upgrade. If you are buying anew — think Mac II. And don't forget the scanner necessary to digi-



"How can I use my beloved Macintosh when everyone else around here is on DOS?"

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"All this will cost me an arm and a leg, right?"

$195 for the package, complete. And that includes Macintosh to Macintosh communications and a TTY terminal emulator. Wang and NBI versions are available, too. See your Macintosh dealer, or call us at (203) 866-4944.

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tize your images into a format readable by the software.

Image Studio works beautifully. Although it's a complex and powerful program, it's easy to learn and use. Expect to devote some time to mastering the techniques of photo retouching — an art in itself. Making pictures perfect has never been easier, but it still requires some talent.

Image Studio
★★★★★
List Price: $495.
Published By: Letraset USA, 40 Eisenhower Drive, Paramus, NJ 07653; (201) 845-6100.
Requires: Mac Plus with two 800K disk drives. Mac II and *MultiFinder* friendly. Version 1.0 reviewed. Not copy protected.

–Carlos Domingo Martinez

IMAGES WITH IMPACT!



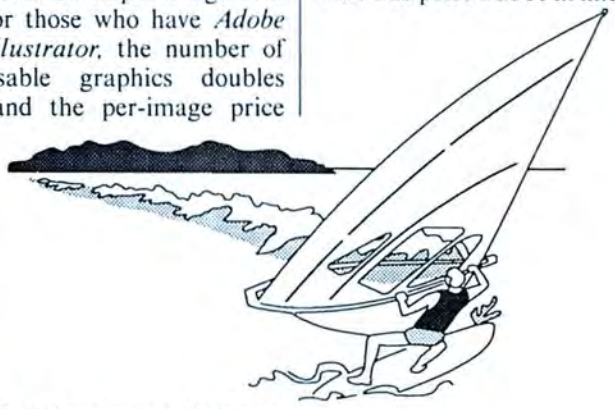
Up to now, a lot of Mac clip art has belonged to the "Dover woodcut/engraving school," best exemplified by the *MacMemories* series. The problem with these graphics, as good as they are, is that they lock you into a sort of turn-of-the-century style that is often inappropriate for the task at hand. And being bit maps deprives them of much of the strengths and glories of the PostScript environment.

Images with Impact!: Graphics and Symbols 1 addresses that problem with high-quality clip art that was created by and for desktop publishers. The images in the present collection have all been created by professional artists with *Adobe Illustrator* and saved as EPS files. They are divided into several categories: display framers and a graphic series — an assortment of cute (that is, traditional) computer clip art, featuring teddy bears and mimes; extremely attractive multigraphics (composite graphics), including a veritable cornucopia of foodstuffs that's sure to send you straight to the kitchen for a snack; a portfolio of eye-catching images, including a cityscape, balloons, and an imposing eagle in flight; and finally, a varied collection of symbols, such as a telephone, assorted stylized human figures, a globe, a taxi, and an airplane. The artwork is logically and conveniently arranged in folders on the two-disk set.

Approximately 75 graphic files are included in the package. This comes out to about $1.40 per image. But for those who have *Adobe Illustrator*, the number of usable graphics doubles (and the per-image price drops to 70 cents) because the composite files can be separated and the individual components manipulated by themselves. In addition, you can harness *Illustrator*'s capabilities to rotate and shade the images. You're limited only by your imagination and the dictates of good taste.

The manual that accompanies the collection is outstanding. It contains more than 20 pages of examples showing how you can use the images in various kinds of DTP documents — from simple business cards to glossy brochures. Hints on how to most effectively use the images in *Illustrator* and page-layout programs abound and will help the helpless and even hap the hapless. A pictorial index of every graphic included in the set rounds out the finest documentation I've ever seen packaged with such a collection. And it reflects well on 3G Graphics that the artists who contributed to the project are fully recognized on one of the opening pages of the manual.

3G Graphics plans to publish similar collections every six months or so. The next one will emphasize business graphics and is due out by the end of the summer. The price will be in line with the company's hope to keep its products in the less than $100 range. If this first installment is any indication, we have a lot to look forward to. My only suggestion for improvement is that the individual graphic elements of the composite files should also be provided as separate graphics for those of us who don't own *Adobe Illustrator*.



Clip art from *Images with Impact!*

Images with Impact!: Graphics and Symbols 1
★★★★½
List Price: $99.95.
Published By: 3G Graphics, 11410 N.E. 124th Street, Suite 6155, Kirkland, WA 98034; (206) 823-8198.
Requires: megabyte+; page-layout program that accepts Encapsulated PostScript (EPS) files; PostScript printer. Mac II and *MultiFinder* friendly. Not copy protected.

— Gregory Wasson

HYPERCARD

HYPERBOOK MAKER



You're the author, the artist — you've created a wonderful *HyperCard* stack and you want to show it off. Friends who have Macs can browse through it; you can put it on bulletin boards; you can even send it to *MacUser*'s "Flash Cards." Or you can print it as a HyperBook.

HyperBook Maker takes all the guesswork out of printing your stacks as books. It figures out the signature breaks so you can print cards on both sides of a piece of paper and still maintain the continuity. This may seem simple, but try it yourself. Fold a few sheets of paper together and number the pages using both sides. The top half of the first sheet of paper is your book's title page, and the bottom half is the back cover. Now try to print your cards in the correct order.

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you can print your stack as a book that opens from the top or as pages that fit into a loose-leaf binder (it does not print from the side, as in a paperback novel). It prints in full-, half-, or quarter-size cards. You can replace a page without reprinting the whole book, print a range of cards — 10 through 36, for example — or even create a new stack from any stacks, with cards selected in any order. *HyperBook Maker* prints to either the LaserWriter or ImageWriter printers.

Patience is a virtue, and at the end of a long wait, you'll be rewarded with half your book. When side 1 has finished printing, you reload the pages for printing the second side. More patience — two halves make a whole — and your HyperBook is finished (the printing, at least).

HyperBook Maker comes with an easy-to-use manual that has clear instructions for producing books, assembling the finished pages, making camera-ready masters, and making new stacks from selected cards. It even covers types of paper and staplers to use.

You should be aware of a few things when using this software. If you're sharing the printer, someone can sneak in a print job while you are reinserting your paper — you may be surprised at what appears on side 2 of your book! The pages are not numbered, so you must be careful to keep them in the right order. The software should have a page-numbering option since it pretends to be a bookmaker.

You can't use your computer during the long process of printing (unless you are using *MultiFinder* and make use of Background Printing to print your HyperBook).

Also, *HyperBook Maker* may not work with all stacks. Version 1.0 resulted in several bombs when I printed stacks that had sound. A conversation with the folks at Ideaform resulted in my getting a new version, 1.1a, that seems to have solved the problem. The upgrade is free.

HyperBook Maker works well when it works. Essentially, it does the sometimes difficult job of figuring out print signatures for you. (Regular printing in *HyperCard* won't do this.) If you have lots of stacks to print in book form (remember, it's fold-over and notebook format only), this may be the software for you.

Hyperbook Maker

List Price: $59.95.
Published By: Ideaform, P.O. Box 1540, 612 West Kirkwood, Fairfield, IA 52556; (515) 472-7256.
Requires: *HyperCard* Version 1.1a reviewed. Not copy protected.

— *Laura Johnson*

MUSIC

DELUXE MUSIC CONSTRUCTION SET



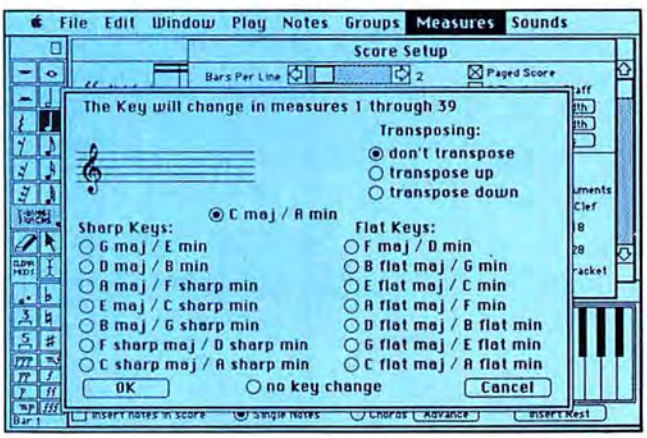
Deluxe Music Construction Set is a notation-based music program that lets you enter up to 48 voices on 8 staves, and play the music through the Mac's internal speaker and/or via MIDI on one or more external synthesizers.

You can enter notes from a palette, a Piano Keyboard window, or from a MIDI keyboard. Recording notes over MIDI is not handled in real time — that is, the program doesn't record rhythms — so it doesn't qualify as a MIDI sequencer, but a clever feature lets you specify note durations from the MIDI keyboard indirectly. The palette also contains modifiers, such as accidentals, dots, dynamics, rests, triplets, and quintuplets.

Dynamic markings, double bars, repeats with first and second endings, slurs, and ties are all available. You can beam eighth (or shorter) notes, and you can also adjust the angle of the beam. The program knows how to display seconds (adjacent notes) in a chord properly, and it carefully follows the rules for maintaining accidentals within a measure. It also handles two distinct voices on one staff and keeps track of the proper stem directions.

The program initially spaces the notes on the staff for you according to their duration, but you can realign notes freely within bars and stretch or shrink bar lines as well. This feature helps create professional-looking manuscripts and is important when working with lyrics.

Deluxe Music Construction Set is equally versatile at handling text. Text blocks for lyrics, tempos, performance notes, and so on are set up anywhere on a page with complete control over font, size, and style.





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1-800-642-7661, (208) 386-3800

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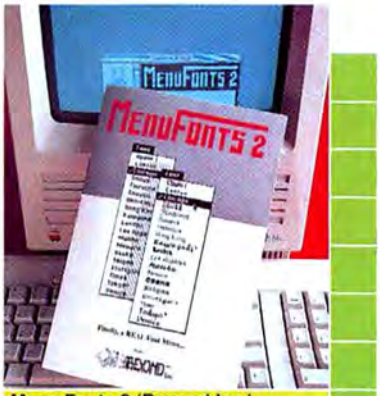
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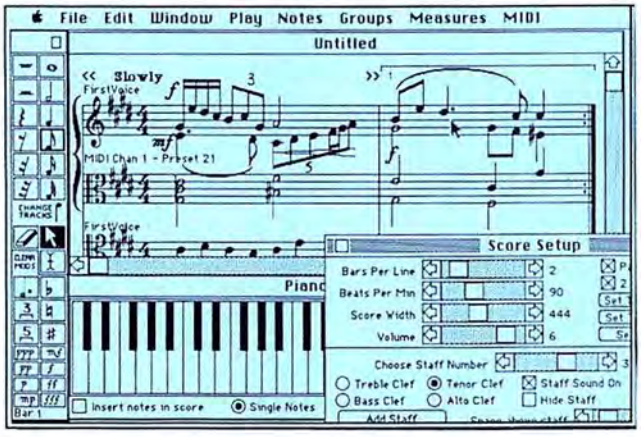
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Quick Clicks

Unfortunately, there is no way to align two different text blocks.

The program uses Adobe's Sonata font for excellent results with a LaserWriter (although you have to purchase the laser version of the font separately). A font is also included for drawing chord diagrams for guitar players.



Deluxe Music Construction Set exchanges files with other music programs that use the SMUS-IFF format, so you can record a sequence in real time, then port it over to *DMCS* and print it out. Unfortunately, the only such program available is the rather unexciting *Sequencer* 2.5 from Opcode Systems. There is a newer file format called MidiFiles (also developed by Opcode), which is used by several high-end sequencing programs. An independent programmer should create a utility that converts SMUS-IFF to MidiFiles so that users of those sequencers can take advantage of *DMCS* as well.

As a musical performer, the program is a bit less successful. The internal sounds are adequate, and the program comes with a disk full of them. They improve markedly if you hook your Mac up to a stereo system. A module is included for designing your own sounds, but it's complex and the documentation is poor.

The MIDI implementation is clumsy. It takes about eight operations to enable the MIDI output, and switching back and forth from internal sounds to MIDI is slow. If you specify a MIDI patch change in one voice, the program sends out patch changes on *all* the MIDI voices. If one of the MIDI synthesizers receiving the unnecessary patch change happens to be holding a note, the note may be cut off.

The manual has a good tutorial, but its reference section is inadequate for serious users. A lot of information is in obscure places, and other stuff is simply missing.

There are also a few strange bugs. The program loses track of where it is if you move too quickly on a page. When you export a file in SMUS-IFF format, the screen goes haywire, with beams to nowhere and measures piled up on top of each other.

Deluxe Music Construction Set is a program that's not quite there, but it's still impressive in some ways. Although several high-end, high-priced, music-notation programs are available for the Mac that rival *DCMS* in power, it still promises to remain a best buy despite its current limitations.

Deluxe Music Construction Set

List Price: $99.95.
Published By: Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404; (415) 571-7171.
Requires: 512K+. Mac II and *MultiFinder* hostile. Version 2.0 reviewed. Copy protected; hard-disk installable.

— Paul D. Lehrman

EDUCATION

READER RABBIT



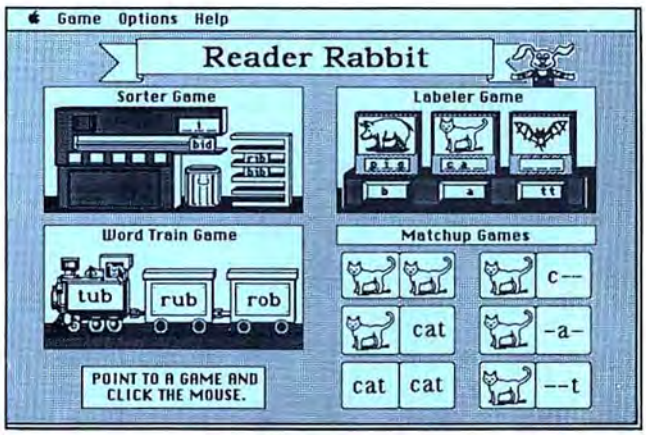
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In the Sorter game, a letter slides out of the Sorter machine. There's a target pattern at the top of the screen; the pattern is a single letter in the first, middle, or last position.

If the new word that comes out of the machine matches the pattern, you just put it on a shelf. If it doesn't match, you dump it in the garbage or just wait and let it fall in by itself. If you put a wrong word on the shelf or let a correct word fall into the garbage, its letters turn white.

The Sorter machine works with groups of five words. For each correct sort of the five, a carrot appears









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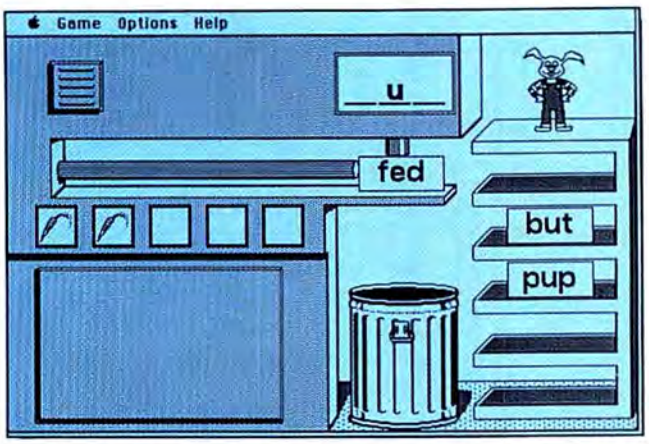
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Quick Clicks



on the screen; for incorrect ones, the carrot box turns dark gray. When words fall into the garbage, you hear them clunk at the bottom. When you put a wrong word on the shelf, the Rabbit says "Uh-oh." (And, this is digitized, not *Macintalk;* it elicited a "What do you mean, Uh-oh?" from my 5-year-old.) When you've finished with a group of words, they slide out of sight and, if all five were correct, the Rabbit does a dance.

With the Labeler game, you have three cartons with pictures on them. There are three boxes of letters at the bottom of the screen; the letters spell out the words that go with the pictures on the cartons. The first box holds all the first letters of the words; the middle box holds the middle letters. (Guess what the last box holds.) By clicking on a letter in one of the boxes and then on the carton to which it belongs, you can eventually label all three cartons. Although both my boys, being experienced Mac'ers, tried to drag the letters into position, they had no trouble switching to the click method without any help.

As you label each carton correctly, Reader Rabbit dances on top of it. (If you put a wrong letter on the carton, it simply goes back into the carton while Rabbit says "Uh-oh.")

The third game lets you move words onto a train. Each word can have only one letter different from the word in the car in front of it. When you make a mistake, the "wrong" car is uncoupled from the train and the train moves away. If you get all four correct, the train moves away while music plays.

The final game on the disk is a concentration-type game. (The generic name for this among the younger set is "memory," after a popular series of boxed games.) You can choose to match pictures, words, pictures and words, or pictures and partial words. A screen of pictures and words is displayed before the game begins — not in their game positions, but just so the child can practice the reading before playing.

There's only one minor flaw in *Reader Rabbit.* A small notice "Click mouse" [to continue] appears occasionally. It's so unobtrusive as to be overlooked and, of course, can't be read by children practicing their reading skills. What's needed is a small picture, with a little flash to call attention to it.

There's lots of attention to detail in every game. The program watches children's answers in a session; words that they handle incorrectly appear again in the next set of words. *Reader Rabbit* is as close to perfection as you could hope for in an educational game. If I could, I'd give it a six-mouse rating.

Reader Rabbit
List Price: $59.95.
Published By: The Learning Company, 6493 Kaiser Drive, Fremont, CA 94555; (800) 852-2255.
Requires: 512KE+ and an 800K drive. Mac II and *MultiFinder* hostile. Version 2.0 reviewed. Copy protected.

— *Sharon Zardetto Aker*

ENTERTAINMENT

GO



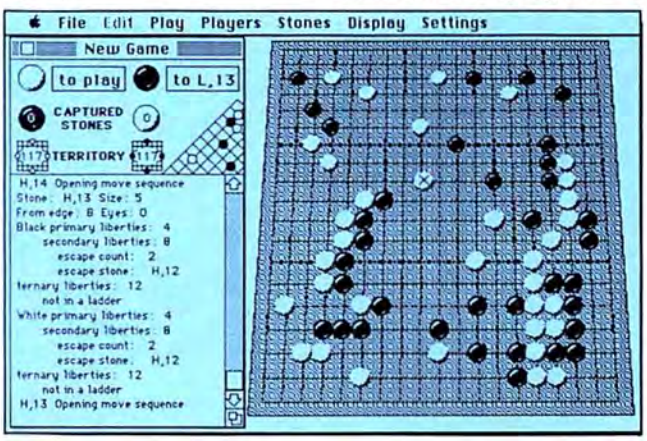
Four-thousand years ago the Chinese played the game of go without using a computer. For beginners who get their start with *GO: The Oriental Game of Strategy for the Macintosh,* you may wonder how they ever did without it.

Of course, people can still learn and advance to shodan status (improved player) the traditional way, plonking their black slate or white clamshell markers over one of the 361 points on a smooth wooden board. But if you don't know other go players, then *GO,* the computer game, is a terrific learning tool that unlocks some of the mysteries of the ancient game.

The basics of go are simple. It's a territorial game that was once used to teach battlefield strategy. A player wins by accumulating more territory than his or her opponent; territory is tabulated by the number of unoccupied points enclosed by the players' stones. Capturing the opponent's stones increases your points; protecting your own territory and stones is paramount.

But don't confuse go with checkers. Strategy can be as complicated as in other sophisticated board games, such as chess. Patience is also more than a virtue in go — it's a necessity. The player who loses a few battles to win the war advances more quickly than the would-be Patton who tries to capture every opponent's stone.

And that's why *GO* is such a good tutor for the uninitiated. The program in-



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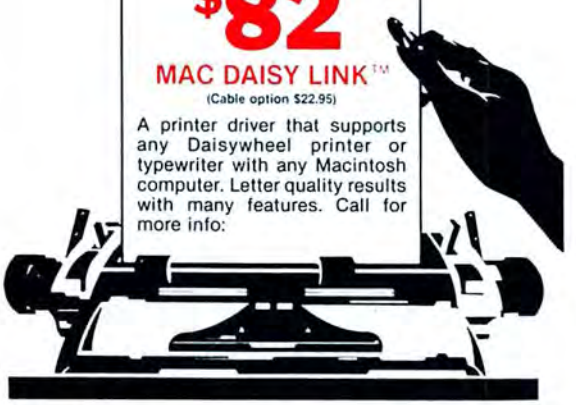
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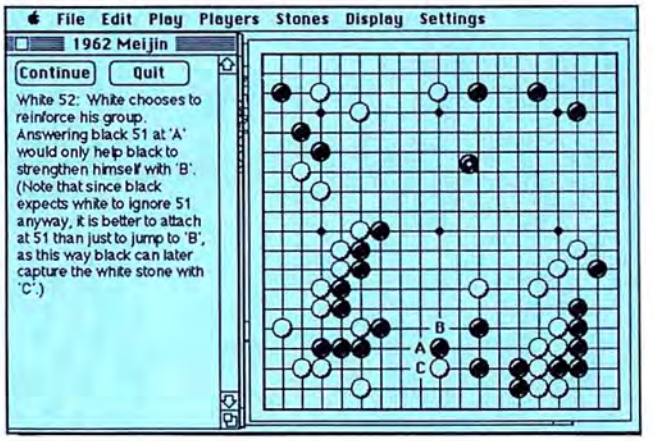
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Quick Clicks



cludes an introduction and four tutorials with examples and practice problems that lead beginners to playing in about an hour.

The program lets the *GO* player match talents against the computer and other players (a modem option is included), save and replay published games, learn from famous games, and choose among different-size boards in two- and three-dimensional patterns.

More important for novices, *GO* explains the reasoning for each move the computer makes (at first you'll wonder why it doesn't do that for your moves, too). You can play, unplay, and replay stones; number each move; keep track of prisoners and territory; and display a "best guess" final score. An Analyze option displays information about a particular position.

GO does not, however, get into the finer points of strategy that make the game difficult to master. The tutorial explains the importance of connections (stringing markers together to increase territory and strengthen position) but gives the concept of two-eyes (a trap to enclose and protect territory) superficial attention.

Still, beginners can practice simple moves against the computer on the optional-size boards (as small as 3 X 3). A 9-X-9 board is a good size to begin with. At that level, you can occasionally beat the computer.

For advanced players, the program's parameters and weights can be altered to provide a more formidable challenge. The program cannot, however, keep pace with better players.

For aesthetes *GO* may not compare with a traditional game (even though the makers of the game have added a plonk sound), and for advanced players the program isn't competitive enough. For novices, however, *GO* is an affordable and educational introduction to the game.

GO
★★★½
List price: $49.95.
Published By: Infinity Software Ltd., 1144 65th Street, Studio C, Emeryville, CA 94608; (415) 420-1551.
Requires: 512K+. Mac II hostile. *MultiFinder* friendly. Version 1.0 reviewed. Not copy protected.

— *John Schacht*

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Big Hard Disks



MEL LINDSTROM

Power users need more storage. MacUser Labs tests 22 100 megabyte and over hard disks.

Finding you need more than 100 megabytes of hard-disk storage on a Macintosh isn't a rarity anymore, but a drive with that much capacity is a major investment. In this second report from the MacUser Labs, we evaluate just what 22 such high-capacity drives have to offer.

Many of the factors that make large-capacity drives a good value are similar to the key characteristics of their small-capacity cousins, but there are some important differences. In addition, large-capacity drives are less interchangeable, so factors such as software, support, and packaging are more often significant.

You're also unlikely to find a full range of models sitting on a local dealer's shelf, which makes it difficult to try out the most probable candidates. Large-capacity disk drives are often a special-order item, and you may have to wait to take delivery, which makes it even more important to find out what you want before you make your purchase.

BY MICHAEL FISCHER, STEVE ROSENTHAL, AND CHIP CARMAN



The factors that make a drive suitable for a particular application do vary, but some general characteristics are almost always applicable. Consequently, we recommend you consider at least the following:

- Capacity
- Speed
- Compatibility
- Ease of use
- Reliability
- "Special" features
- Price

CAPACITY

All of the drives we looked at for this report hold far more data than the average 10- or 20-megabyte drives you find on most desktops. How much capacity you need, of course, depends on your exact application, and predicting the amount isn't always easy (see sidebar). In most applications, even if you can make some trade-offs, you still need a drive of a particular capacity level or larger.

So the amount of data a drive can store is a key characteristic, but the nominal capacity value the manufacturer states is only a rough guide. In many cases, drives are labeled with the raw, unformatted capacity of the disk, rather than the actual working space they provide after addition of crucial formatting and structuring information.

Furthermore, some drive vendors round out the amount of storage to an even multiple of 10 megabytes, whereas others report to the nearest megabyte value. The drives we tested for this report claimed nominal capacities from 100 to 761 megabytes.

To determine the actual working storage each drive provides, we formatted each one and then checked what the *Finder* reported as available storage (see "Hardware Features" chart). Most of the tested systems reported a figure close to the 97% of nominal space available, but a few showed as little as 93%, and at least 5 show a true value greater than their nominal ratings.

Incidentally, within a similar performance class, drive prices go up in far smaller increments than do increases in capacity — so the price per megabyte of storage tends to fall as the total capacity goes up. (see "Price Per Megabyte" chart). Until you hit the limits of practical technology, one double-size drive costs far less than two of any given capacity.

Furthermore, the amount of storage most users need gets larger as time goes by. If you can afford it, you would be wise to invest in extra capacity now to allow for future growth.

SPEED

Applications that need multiple megabytes of disk storage typically spend a lot of time finding and moving around the right bytes of data. How quickly the disk drive can read and store information makes a big difference in how quickly these applications can respond to your requests.

Speed is particularly essential for drives that store the common data and programs on big networks. Drives in such file-server applications must keep up with overlapping requests from multiple users.

If you're planning to stick with the original AppleTalk wiring (now called LocalTalk) and your application isn't heavily weighted toward short transactions, you'll probably be bound more by network speeds than by even the pokiest of the drives we tested. Users of busy EtherTalk systems, though, will appreciate those extra milliseconds.

Theoretically, you can rate a drive by how long it takes to move to the

Who Needs a Centamegabyte?

Do you really need a hundred megabytes of disk storage or more? There are several reasons why a large capacity disk is useful or even absolutely necessary. These include:

- Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) applications, which typically have very large data files associated with them.
- Video applications storing large, digitized images. An emerging technology on the Macintosh II uses 24-bit color for very-high-resolution video display. These pictures require significantly more storage than either the 1-bit (black-and-white) images on the Macintosh Plus and SE or the 8-bit color images on the Macintosh II with an expanded video card.
- Sound applications require large data files, particularly if they involve digitized sound or long songs.
- Large database files obviously use significant amounts of disk space.
- Network file servers also require a large amount of storage, principally because these units contain program and data files for many different users connected to the network.
- The *A/UX* UNIX operating system for the Macintosh II comes on an 80-megabyte hard disk. If you are running this operating system, and programs under it, you may well require a large-capacity hard disk.
- Macintosh owners are using more applications and want to have them available on the hard drive. These applications are generally more powerful and take up more disk space for both the program code and the data files. A notable example of this is *HyperCard*.
- Operators of a bulletin board system typically need large storage, both for the message and electronic mail facilities of the system and for holding the public domain and shareware programs that are uploaded to and downloaded from the system.
- Finally, software "junkies" may also want a large-capacity disk drive. The person who not only collects many different programs, but also uses most of them, may well benefit from having all these programs available on the hard drive.
- If you're looking at storing databases, there is one requirement of these programs that may not always be obvious. If you are sorting or otherwise reorganizing a large data file, the program may require free disk space equal to the size of the data file, plus some additional room for various scratch files and pointers. Thus, if you have a 40-megabyte data file, you may well need 50 megabytes of free disk space to perform a sort or reorganization of the file. (For example, the *4th Dimension* program requires twice as much disk space as the size of a file to repair the file.)



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MacUser LABS

Performance Tests: Hard Disks

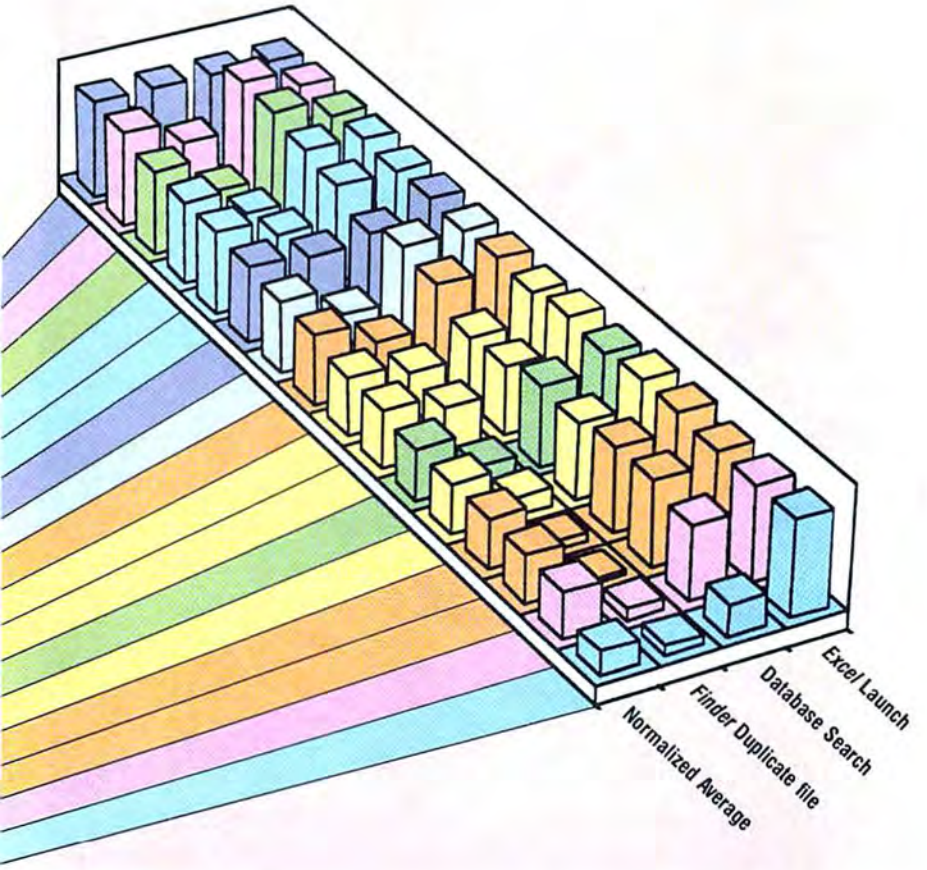
Mac SE Performance Test Results

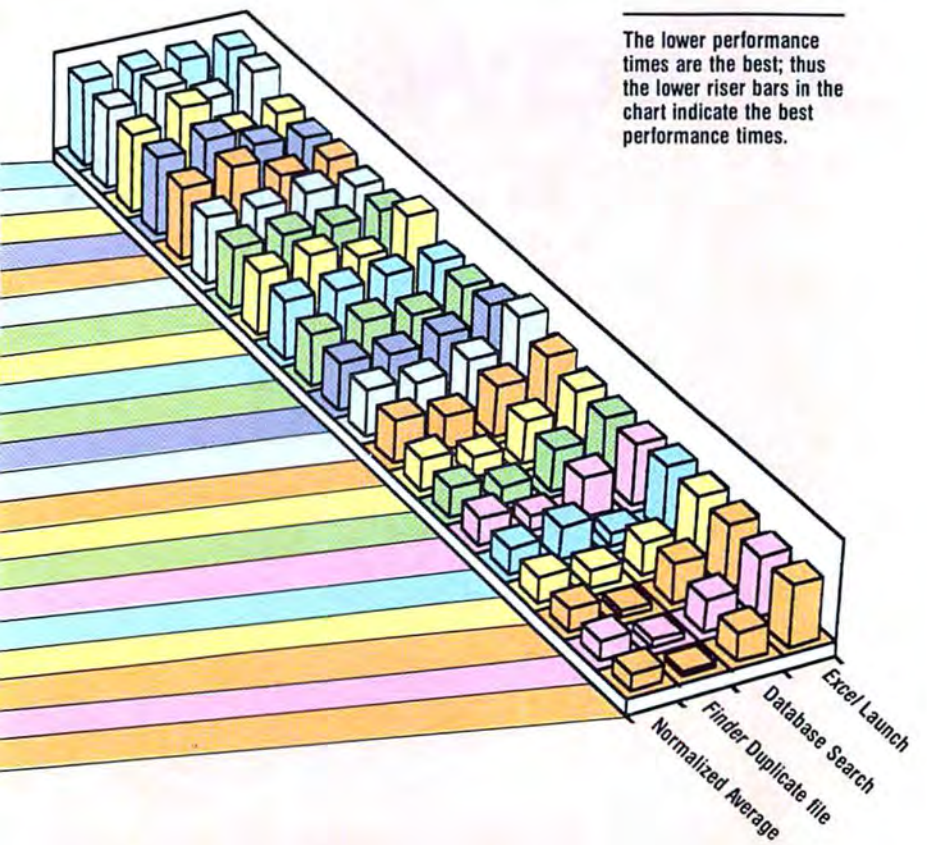
Manufacturer	Product	Manufacturer Stated Capacity	Normalized Average	Finder Duplicate File	4th Dimension Database Search	Excel Launch
Giga Cell Systems	Data Cell 150	150	100	634	684	46.5
Micah Storage Systems	Micah Drive AT144	144	99	526	773	47.0
Peripheral Land	PL140 Turbo	144	92	446	760	46.5
Rodime	100 Plus	100	91	471	719	47.9
Northern Telecom	Memorybank SS400/MAC761	761	91	503	688	46.8
Northern Telecom	Memorybank SS400/MAC485	485	87	533	610	47.3
Jasmine Technologies	BFD 8B	430	85	424	683	46.5
Microtech International	NOVA 120	120	83	438	647	47.0
SuperMac Technologies	DataFrame XP 150	150	76	440	555	45.8
Priam	EM230 MacDisk	230	76	421	562	47.9
Jasmine Technologies	Direct Drive 160	160	72	324	613	46.3
MacProducts USA	Magic 150	150	71	327	592	48.0
Relax Technology	H 300P	300	70	285	628	47.8
FWB	hammer300	300	69	**270**	629	**45.6**
Priam	EM330 MacDisk	330	68	299	584	45.8
Giga Cell Systems	Giga Cell 290R	290	54	293	**403**	45.8

Performance Times (All times in seconds). Products are listed in descending order by the average of the test results.

Mac II Performance Test Results

Manufacturer	Product	Manufacturer Stated Capacity	Normalized Average	Finder Duplicate File	4th Dimension Database Search	Excel Launch
Rodime	100 Plus	100	100	435	355	24.1
Rodime	1400 RX	140	96	450	305	24.0
Priam	EM230 MacDisk	230	94	465	278	20.2
Giga Cell Systems	Data Cell 150	150	93	435	306	19.9
Microtech International	NOVA 120	120	89	420	285	20.3
Jasmine Technologies	BFD 8B	430	84	358	306	19.6
Rodime	1000 RX	100	80	353	278	19.6
CMS Enhancements	Pro 140K-II/i	140	79	365	258	23.2
Giga Cell Systems	Giga Cell 290R	290	77	333	277	19.0
Peripheral Land	PL140 Turbo	144	70	313	238	19.2
Northern Telecom	Memorybank SS400/MAC485	485	69	288	254	20.4
Personal Computer Peripherals	IHD144	144	68	278	256	23.2
Relax Technology	Internal 172	172	65	251	256	20.4
SuperMac Technologies	DataFrame XP 150	150	55	199	229	18.9
Jasmine Technologies	Direct Drive 160	160	53	191	225	18.9
Priam	EM330 MacDisk	330	52	182	221	18.9
Northern Telecom	Memorybank SS400/MAC761	761	50	244	**144**	19.9
MacProducts USA	Magic 150	105	50	190	195	19.4
Relax Technology	H 300P	300	47	152	215	19.2
CMS Enhancements	Pro 300-II/i	300	45	155	196	**18.6**
FWB	hammer300	300	43	**146**	185	18.8





The lower performance times are the best; thus the lower riser bars in the chart indicate the best performance times.

MacUser Labs Hard Disk Tests

Sound Test

First, we measured the sound emitted by each drive in a quiet room. Next we measured the additive sound level of both computer and disk drive. The result: The disk drives contributed a negligible noise amount that was barely noticeable — approximately 1 to 2 dBAs. The meter used was set to the ANSI C weighting, and the microphone placed 18 inches in front of the test unit.

Testing Environment

All Macintosh SE and II tests were carried out using the boot drive as the drive under test. The Macintosh SE contained 2.5 MB RAM, the RAM cache was turned off in the Control Panel, and there was no internal hard disk drive connected to the computer. The Mac II tests were done on a color Mac II system containing 5 MB of RAM, with the RAM cache turned off at the Control Panel. The two-bit gray mode was selected for the monitor characteristic (video bit depth). The drive under test was chosen as the start-up device.

***Excel* Loading Test**

This test measured the time it took to load and open a file by loading a 235K *Excel* loan amortization spreadsheet from the desktop. This test emphasizes the read-only characteristics of the drive under test. The starting time began when the tester double-clicked on the document icon and ended when the matrix cursor appeared on the spreadsheet window.

***4TH Dimension* Database Search**

This test measured the time it took to search through a large database. This test shows how fast the computer can read and process the information from the drive.

The 43.49-MB database encompassed 350 records with 35 fields each. The fields were divided between numbers, text, and a graphic image. Field four contained a zero in every record; the search checked for a zero in field four of each record. All searches were conducted on a non-indexed database and no searches had been conducted previously. We created a database on the freshly formatted hard disk using a global routine. Test times began when the last entry was selected in the search window and ended when the last line of data was written to the screen.

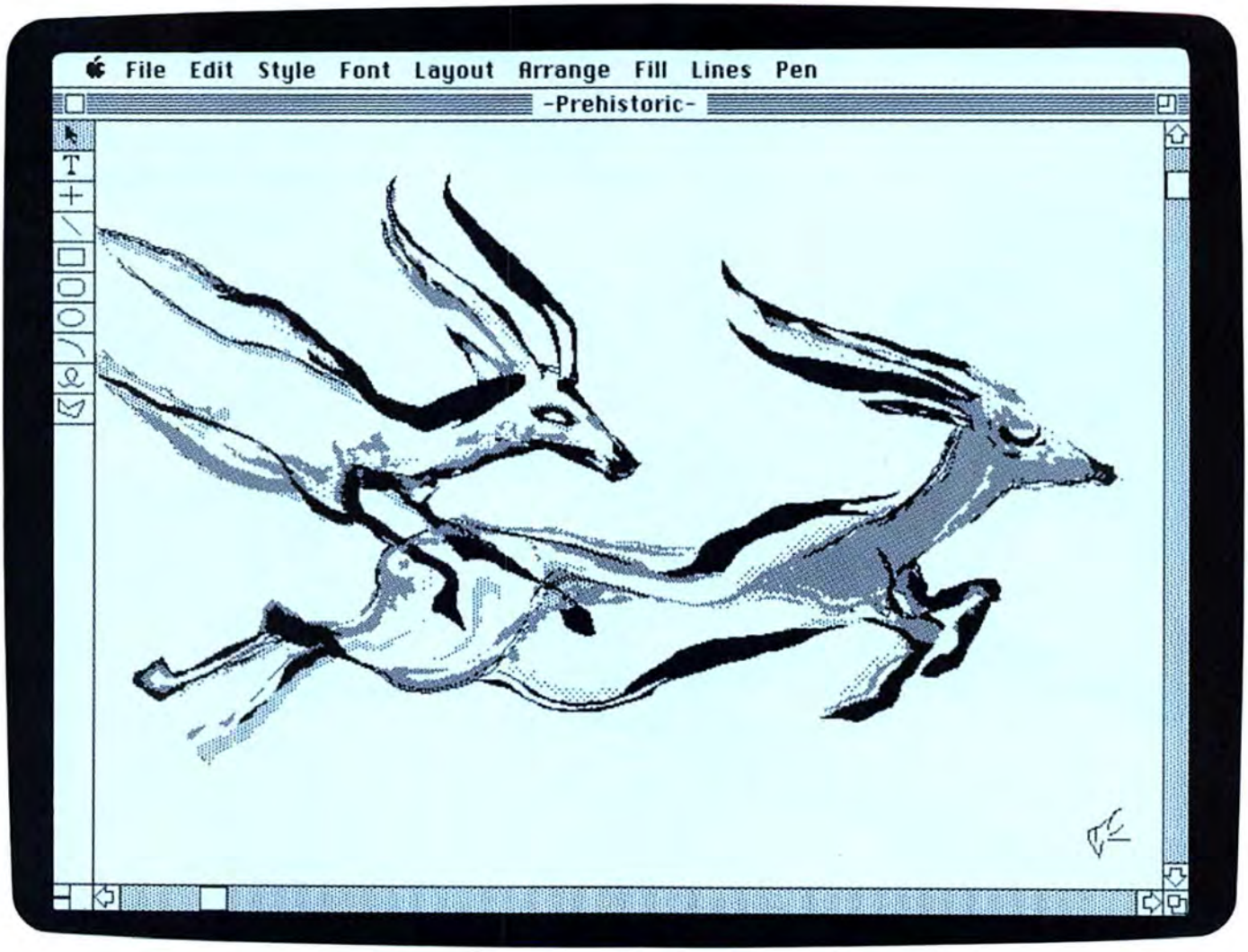
Duplication of a Large File

This test measured the time to make a copy of the 43.49-MB database that was created for the database search. This evaluates the ability to read from and write to the hard disk without processing the data. At the *Finder* level, the icon for the folder containing the database and its structures was highlighted and duplicated by choosing DUPLICATE from the File Menu. The test time started on mouseUp after the selection of DUPLICATE and ended when the duplicate folder appeared in the window.

The 3D Charts

Smaller is better. Bar riser heights correspond to time measured in tests. The higher the bar — the more time the hard disk took. To represent test data in this way, we normalized the actual time by taking the highest number from each test and making that equal to 100. This allowed a relative representation of all the data side by side. Actual time in seconds for each test appears to the left of the 3D charts.

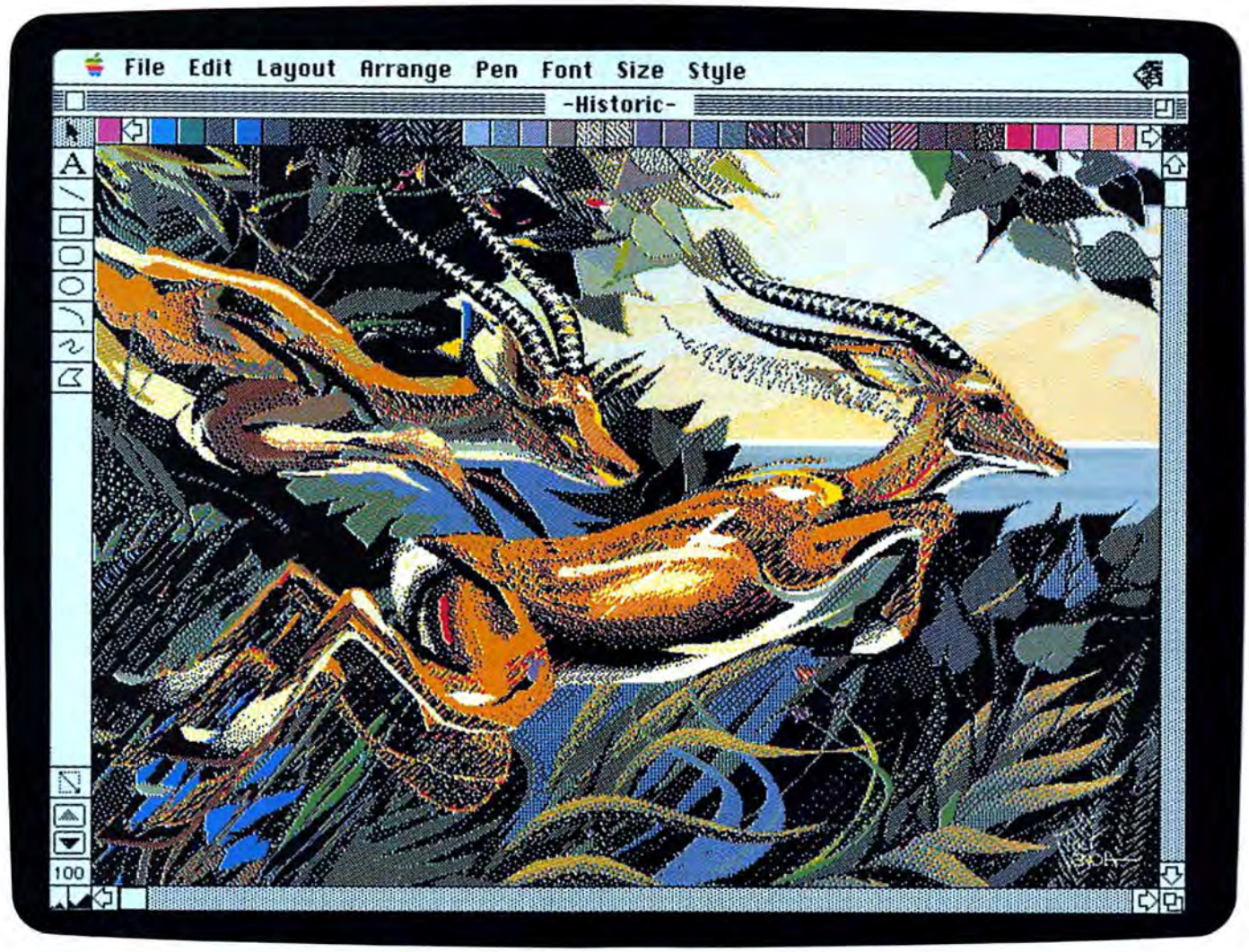
The ordering from slowest to fastest was done by adding together all the test times for each drive for a total rating. In this way the ordering reflects the overall performance of the drive for all tests.



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right track (seek time), how long an interval it needs to home in on the precise track position (the settle time), and the time that passes before the correct disk position rotates around to the read/write head (the latency).

Unfortunately, those figures alone do not tell us how well the drive will perform in actual use. You have to take other factors into account, including the speed of the driver software and the presence or absence of speedup techniques such as caching.

MacUser Labs performed several speed tests on each drive. We carefully set up these tests to eliminate extraneous factors such as disk fragmentation and gave the drive a variety of typical tasks. If a drive was compatible with both a Maintosh SE and a Macintosh II, we conducted the tests with the drive connected first to one machine and then to the other.

Our test results, which appear in scatter charts, graph the speed results vs. price, which lets you compare both absolute values and a simple price/performance ratio. The charts are in

Interleave: When Faster Doesn't Help

Some differences in performance between the same unit connected in turn to a Macintosh II and a Mac SE may result from the peculiarities of a factor known as "interleave." The factor denotes a process of recording logically successive sectors at intervals around the disk instead of directly one after another.

Interleaving is often necessary to take into account the time it takes a computer to process the information read from each sector. A fast computer, such as the Macintosh II, can process the data in a sector as fast as it can be read by the disk head. This allows an interleave of 1:1, which means that consecutive sectors of data are physically contiguous on the disk.

The Macintosh SE is a medium-speed computer. It requires about twice as much time to process a sector of data as it takes the head to read that data. Thus, the drive head should only read every other sector, resulting in consecutive sectors of data being placed one sector apart. This is known as an interleave of 2:1. The Macintosh Plus is slower still and uses an interleave of 3:1.

A speed loss can occur if you use a drive that is initialized in an interleave factor for another machine. For example, if you use a drive with an interleave of 2:1 on a Macintosh II, the Macintosh must wait as every second sector passes under the head.

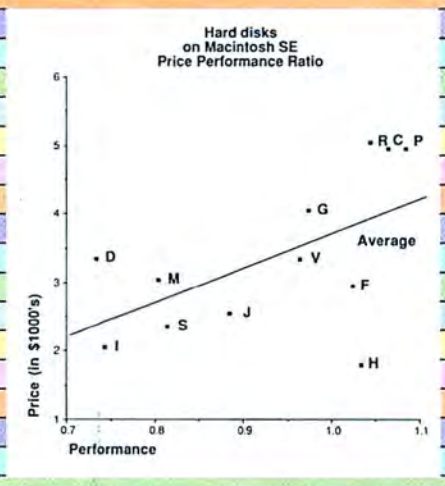
On the other hand, a drive with an interleave factor of 1:1 will operate significantly slower on a Macintosh SE because the computer normally misses the following sector after reading one, requiring a wait while the drive platter spins nearly a full revolution for each sector that is read.

For networks, or even for a dedicated application that does a lot of disk accessing mixed with processing, finding the best-fitting interleave can dramatically improve system performance. One of the key components of network "tuning," in fact, is finding the right interleave for the particular configuration and typical job mix.

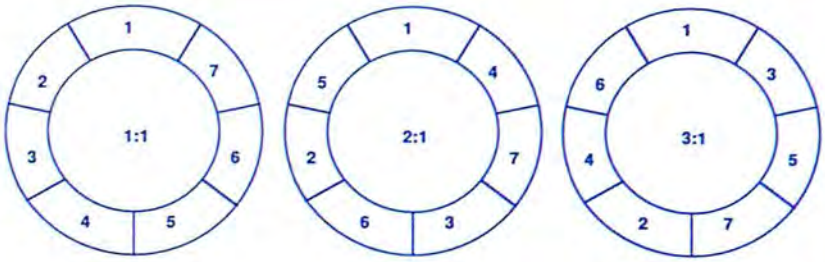
Most drives come with formatting software that automatically determines the

Price/Performance Ratios

Key	Manufacturer	Model
A	CMS Enhancements	Pro140k-II/i
B	CMS Enhancements	Pro300-II/i
C	FWB	hammer300
D	Giga Cell Systems	Data Cell 150
E	Giga Cell Systems	Giga Cell 290R
F	Jasmine Technologies	Direct Drive 160
G	Jasmine Technologies	BFD 8B
H	MacProducts USA	Magic 150
I	Micah Storage Systems	Micah Drive AT144
J	Microtech International	NOVA 120
K	Northern Telecom	Memorybank SS400/MAC485
L	Northern Telecom	Memorybank SS400/MAC761
M	Peripheral Land	PL 140 Turbo
N	Personal Computer Peripherals	IHD 144
O	Priam	EM230 MacDisk
P	Priam	EM330 MacDisk
Q	Relax Technology	Internal 172
R	Relax Technology	H 300P
S	Rodime	100 Plus
T	Rodime	1000 RX
U	Rodime	1400 RX
V	SuperMac Technologies	DataFrame XP 150



These scatter charts reflect price plotted in relation to overall performance of each drive.
The total performance figure was obtained by totalling the test times for each drive and inverting that figure so that the fastest drive (smallest total) has the highest performance figure. Here, the faster the drive — the higher its total performance figure. For instance, for disk drives tested with Mac IIs: a performance figure of 3 is about equal to 350 seconds of the total performance time and a performance figure of 1.5 is



machine it is running on and adjusts the interleave factor accordingly. If, however, you want to initialize a disk on one machine but plan to use it on another machine, you want formatting software that allows you to adjust the interleave.

Incidentally, even with the proper interleave, disk fragmentation can seriously cut the speed of disk-intensive operations. Normally, files are stored on the disk in contiguous areas. This allows the drive to read the information from a file faster, because it doesn't need to search all over the disk surface to find the data. However, as you add or delete files, new or extended files may not end up in contiguous runs of blocks. Rather, the information is stored in several different little pockets of space, resulting in a fragmented file. The more you modify, delete, and add files to a disk, the more you risk fragmenting the data.

There are programs that let you take all the files on your disk and copy all of them to contiguous blocks, eliminating the fragmentation at that time. Of course, you have to spend the time performing the operation. And you should do a back-up before running such programs, to avoid the risk of losing all your data should the program abort.

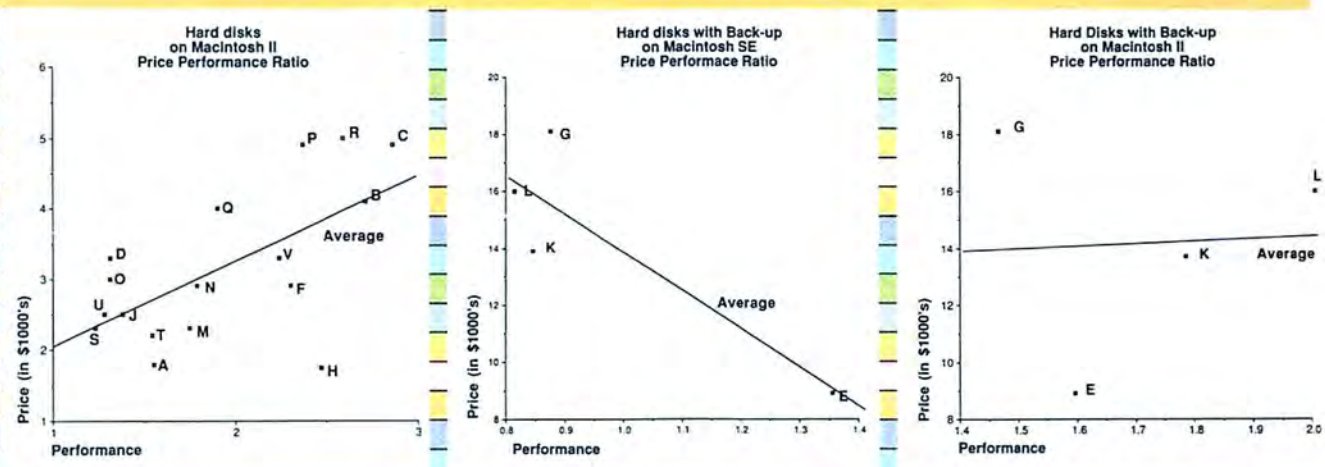
four groups. One is for Mac II drives with built-in back-up units, and another is for Mac II drives without built-in back-up units. The other two are for Mac SE drives with and without built-in back-up units.

On each chart, the heavy diagonal line represents the mean (average) price/performance ratio for the full set of drives. Drives whose price/performance ratios fall below this line have a better-than-average price/performance ratio, whereas those above the line have a worse-than-average price/performance ratio.

COMPATIBILITY

An otherwise wonderful drive won't do you much good if you can't hook it up to your system, and not every drive we tested works in every circumstance.

Fortunately, Apple was an early adopter of a basic interface standard formally called the Small Computer System Interface, though better known by its acronym SCSI (generally pronounced "scuzzy"). Apple has included SCSI ports on all Macs starting



about equal to 650 seconds of the total performance time.
The closer a point is to the bottom righthand corner of the chart, the better the price/performance ratio. Drives below the line are considered a better-than-average buy, those above the line are worse than average — but be sure to check the feature grid for all the options.
Note: The following price/ performance ratios are based on the manufacturers' suggested price as of our testing; prices may vary by the time you purchase a drive and it will affect the price/ performance ratios.

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	subtotal	
	Calif Res. tax (7%)	
	S & H	1.50
	total	

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with the Mac Plus, and you can even get add-on SCSI ports from third parties for earlier models. Unlike more basic interfaces between a controller and a disk drive, the SCSI connection links one controller or more (usually built into their drives) and a processor. Other devices, such as printers and scanners, can also use the SCSI interface.

As for physical characteristics, most of the drives we tested came in their own external cabinet, so the only problem was finding enough space on or under the desk for another box — many of the units occupied more than two square feet of desk space, and some better than two feet vertically.

All the drives intended for internal mounting in a Mac II fit properly, and we had no problem with their installation. If you're adding an internal drive to a Mac II with other improvements, be sure to observe Apple's suggested limits on power connections to avoid power-supply or overheating problems.

ERGONOMICS AND EASE OF USE

If you already use a hard-disk drive,

Technology Determines Density

Disk drive capacities have zoomed over the past few years, but the physical size of the typical hard disk has been shrinking. That's because drive makers have been able to pack more storage surface into each drive and raise the storage density of each surface.

As with floppy disks, the information on a hard drive is stored as magnetic patterns in a coating layer of a circular disk. Lower capacity hard drives often get by with one double-sided platter inside the drive, but the high-capacity models typically use multiple platters, each of which stores many megabytes.

Information on a hard disk is stored in tracks, concentric circles of information evenly spaced along the circular surface of the disk. The amount of information that a particular disk surface can hold is based on how closely the drive mechanism can pack tracks together and still distinguish between them, and how closely you can place information along each track without having the various bits of magnetic information interfere with each other.

This last factor is known as the flux density and is typically presented as the flux changes per inch (fci). While the maximum fci for a particular disk surface may be constant, there are various methods of using these flux changes to encode digital information.

One of the early methods, used with the old 8-inch single-density floppy disks, was frequency modulation (FM), which marked each possible bit with an extra set of transitions for an independent timing signal. The later double-density methods, such as modified frequency modulation (MFM) or modified-modified frequency modulation (M²FM), did away with the separate timing signal and therefore made twice as many of the limited flux changes available for carrying data.

The Integrated Woz Machine (IWM) floppy controller in the Macintosh that controls the 3½-inch floppy drives uses a still different efficient encoding method known as Group Code Recording (GCR). With this technique, the groups of data bits are represented by special bit patterns collectively, rather than individually, allowing fewer flux changes to represent more data bits.

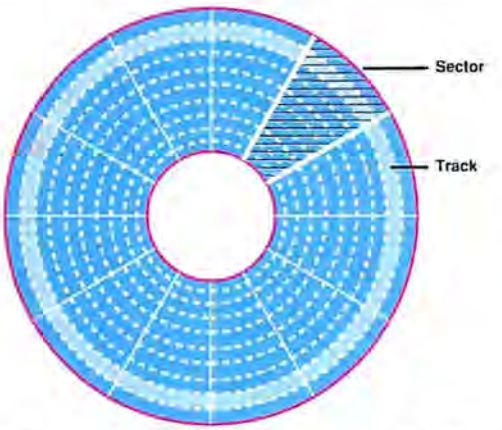
Many high-density hard disks today use a very efficient means of recording data known as Run Length Limited (RLL). As with GCR, the drive reads and writes special patterns rather than individual data bits, but the actual patterns and translation techniques are slightly different. However, while this method can boost the capacity of a disk by 50% compared to the more traditional methods, several companies initially experienced reliability problems with their models that used RLL. MacUser Labs found no problems, though, in any of the RLL models we tested.

All of these packing methods are limited by the maximum allowable density on the inner track of each disk, because the geometry of a disk shape makes a track closer to the center smaller than one on the outside. Mac floppy drives use variable speed motors that allow them to pack extra data into the longer-circumference outer tracks without excessively cramping bits in the shorter inner tracks. But because MFM is more efficient than GCR, you might expect to see Apple use another

you will either puzzle over our inclusion of the ergonomics and ease-of-use factor or know immediately why we used it. Under ideal conditions, you should take a new hard-disk drive, attach it without difficulty to your Macintosh, initialize the drive, and begin to place files on it. You should never notice the drive again, unless it gets too full. (Of course, we're not counting the need for data back-up.) In reality, however, disk drives need installation and ongoing organization.

As far as installation is concerned, one of the main considerations is how easy it is to set the SCSI unit number. Each drive on the system must have a unique number, and the ones with higher numbers get priority service. Following the normal SCSI practice, you can number drives 0 through 7, although in practice the number 7 is reserved for the SCSI designation of the Mac itself. The "Hardware Features" chart lists the method each drive provides for setting the unit number.

Documentation and software support are important factors that affect ease of use, both during and after in-



scenario in the future: the variable speed motor technology with MFM to provide a 1.4-megabyte floppy disk capacity, instead of the current GCR encoding for a .8-megabyte floppy disk capacity.

While Apple floppy drives change the motor speed to increase the bit density, Control Data, a supplier of drives for several of the units we tested, changes the rate at which the data is read from or written to the disk to maintain a consistent high density across the media. This technique is called Zone Bit Recording (ZBR). These zone-bit formats can increase the disk capacities by 30%.

The race for more data in less space is apparently not over. Several other techniques are being studied to increase the recording density on a disk surface. These include:

- Making the magnetic medium thinner.
- Modifying the type of medium used. While iron oxide is commonly used today, other media exhibiting potentially improved area density are cobalt-coated iron oxide, chromium dioxide, nickel iron alloys, and pure iron.
- Changing the method by which the medium is deposited on the disk surface. A plating-type process is commonly used today, although sputtering, which places the material on the disk surface using a high negative voltage in an inert gas atmosphere, is used in some cases.
- Perpendicular recording in which the magnetic fields are perpendicular to the disk surface rather than parallel to it.
- Magneto-optical techniques that use a laser beam to read and write the magnetization.

All of these techniques promise even greater density of data storage in the future, with the potential for larger mass storage devices in smaller units and, eventually, at lower prices.

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stallation. We therefore rated each drive on its documentation in particular and the overall ease of use in general.

If you've never had a hard-disk drive, you might not think of considering noise level. Unfortunately, if you have a unit in which platters are spinning at 3600 revolutions per minute, some noise will occur. In addition, many of the units contain their own fans, further adding to the aural impact.

Our tests found that most units produced a reading of close to 60 dB, which compares to the 50 - 55 dB background in a quiet office and up to 85 dB for a busy street corner.

RELIABILITY

An ideal disk drive would always read back the recorded data perfectly, always find the correct track, present a perfect recording surface, and never break down. Most Mac drives come pretty close to that goal, but even small shortcomings can be significant.

All the drives we tested claimed to meet or exceed the usual industry standard of fewer than 1 in 10^{12} hard errors, and we found no reason to doubt those claims. All the drives, furthermore, used a form of error detection (usually a so-called cyclic-redundancy code, or CRC) that offered fairly effective warning of potential data errors.

As is also normal practice, all the large-capacity drives we tested included automatic bad-sector mapping — meaning the drives substituted spare regions from the disk for any small portion that tested defective during the disk-formatting process. Having at least a few such defects is seemingly inevitable on high-capacity media, but all the drives successfully hid any bad sectors from application programs and the operating system.

Although bad sectors on a disk are common, catastrophic failures are quite rare.

Head crashes — in which the head assembly touches or digs into the disk surface while the disk is rotating, rather than flying over the surface on a cushion of air — are of concern to all hard-disk users, even though their actual occurrence rate is slight compared to that of the more common causes of data loss such as operator error and software failure.

Increasing data densities may make a disk more vulnerable to crashes, because most of the techniques for packing in more data require reducing the separation between the disk surface and the drive head. The smaller the distance between the head and the disk surface, the more likely the risk of a head crash.

Hard-disk drives are somewhat sensitive to temperature and altitude changes, so you should let them stabilize after any significant environmental change. Getting dirt and dust between the head and the disk surface, which can theoretically cause scratching or even a crash, is rarely a problem in ordinary environments because hard-disk drives for the Macintosh all use a sealed head-disk assembly (HDA). This type of configuration allows only highly filtered air into the crucial areas of the drive, although you can still bring most drives down by spilling sugary coffee over their external mechanisms.

Shaking a drive when it's not running — and even the ordinary computer start-up and stopping process — can cause a loss of data due to bouncing of the head on or close to the surface, so many disks have a head-locking mechanism that prevents such a disaster. In addition, all the drives but one have an automatic parking feature that places the heads over a nondata area for normal starting and stopping.

All drive manufacturers list a "mean time between failure" (MTBF), but they don't calculate that value by actually testing drives and determining how often they fail. Rather

SCSI Standard

When the Macintosh Plus was introduced, it included a then-new disk drive interface standard known as SCSI (pronounced "scuzzy" and short for Small Computer Systems Interface). Each succeeding Macintosh has also had this interface built in. Nearly every hard disk drive made for the Macintosh today is a SCSI unit.

The SCSI standard, while originally designed only for hard disk drives, can be used for connecting more than just drives to the Macintosh. For example, the LaserWriter II SC connects to the Macintosh SCSI port.

The SCSI port allows the chaining of up to seven different peripheral units to the host Macintosh. Each unit attached to the SCSI chain is given a different number (from 0 to 6) that represents the priority of that device on the chain. The Macintosh itself is also a unit on the chain, and is given a priority level of 7. The higher number values get greater priority when there are multiple requests for the use of the SCSI lines.

Apple was an early adopter of a basic interface standard. In fact, Apple implemented SCSI before ANSI (American National Standards Institute) had a standard. When the ANSI standard, X3T9.2, was adopted, it called for the use of channel architecture (a set of command instructions to manipulate the hardware interface to the NCR 53C80 SCSI controller chip). Apple's implementation of SCSI uses the channel architecture, but it could not handle a "unit attention on power-up-reset," and there was a bus time-out problem. This required third-party manufacturers to compensate for these two exceptions in their firmware. Apple's implementation of SCSI ignores the UNIT ATTENTION command. When a unit using this command is powered up, the Macintosh does not acknowledge the UNIT ATTENTION, preventing further progression of data transfers such as reading data that is required for booting from that drive.

The ANSI standard also calls for a 50-pin SCSI port, but Apple uses a 25-pin SCSI port. Specifications state that the 50-pin version works with a potential 4MB per second data transfer rate, and that the 25-pin implementation has only a 1.25MB per second maximum data transfer rate. That seems like a lot of speed to give up, but keep in mind that the Mac II's actual transfer rate is only 937K per second, so the 25-pin connector implementation does not sacrifice speed, but allows a less expensive connector.

they make several well-educated guesses to determine the figure. As a result, the difference in reliability between one drive rated at 17,000 hours' MTBF vs. another rated at 25,000 hours' MTBF may be negligible. Perhaps more important is the overall reputation of the drive manufacturer, which involves two different factors:

- the manufacturer of the drive assembly itself and,
- the final manufacturer that packages the entire unit.

Most final manufacturers will tell you who makes their drive mechanism, and we've listed that information for the drives we tested in the "Hardware-Features" chart.

Each company has its share of strong adherents and detractors. The best advice here is to listen carefully to people, particularly those whose judgments you trust. Other factors to consider in the reputation of a company involve how long it has been in business, how much of a commitment it has demonstrated to the Macintosh market, and the length and coverage of its warranty.

SCSI Terminators

The purpose of the SCSI terminator is to prevent electrical reflections that could potentially cause noise and strange behavior, making the SCSI bus very unhappy. A properly terminated SCSI bus is similar to suspending a rope with a person holding onto each end of the rope. An unterminated cable is like one person holding a whip.

When you look at Apple's diagram of when to use a terminator, it may seem confusing, but it is really quite simple; you just need to know whether your SCSI device has a built-in terminator or not. The rule is: There must be a terminator at the beginning and the end of the SCSI bus. Thus, if you have an internal SCSI drive, chances are that it is already terminated, so you only need to add a terminator to the end of the line if there is more than one SCSI device. A Mac II or SE without an internal drive needs at least one terminator between the Mac II/SE and the first SCSI device, and one more at the end of the line, if there is more than one SCSI device. So don't let your SCSI devices whip you; this could lead to strange behavior.

SCSI and the LaserWriter II

Care should be taken, when a SCSI drive is used on a SCSI chain that either includes a LaserWriter II SC or is connected to the auxiliary SCSI port on the LaserWriter II NTX. The signals used with the LaserWriter II SC or NTX printers vary from the usual set of disk control commands. Consequently, many SCSI drives cannot handle the SCSI command inquiries that Apples uses and do not work properly with the LaserWriter II SC or the LaserWriter II NTX.

In many cases, say SCSI experts, all that is needed is a modification to the initial driver code contained in ROM on the hard disk's controller. It is expected that at least some of the hard disk manufacturers will be providing upgrade ROMs to permit operation of their units with these new members of the Apple LaserWriter family.

Software Features

Manufacturer	Model	Formatting	Driver Installer	File Utilities	Partitioning	Copy Utility	Back-up	Spooler	Show SCSI ID	Phone Support	Manual
CMS Enhancements	Pro140k-II/i	✓	I	✓	✓	NO	✓	NO	✓	NO	GOOD
CMS Enhancements	Pro300-II/i	✓	I	✓	✓	NO	✓	NO	✓	NO	GOOD
FWB	hammer300	✓	U	✓	✓	✓	✓	✓	✓	✓	GOOD
Giga Cell Systems	Data Cell 150	✓	I	✓	✓	NO	✓	✓	✓	✓	GOOD
Giga Cell Systems	Giga Cell 290R	✓	I	✓	✓	NO	✓	✓	✓	✓	GOOD
Jasmine Technologies	Direct Drive 160	✓	U	✓ (2)	✓	NO	✓	NO	✓	✓	GOOD
Jasmine Technologies	BFD 8B	✓	I	NO	✓	NO	✓	NO	✓	✓	GOOD
MacProducts USA	Magic 150	✓	I	✓ (2)	✓	NO	NO	NO	✓	✓	FAIR
Micah Storage Technology	Micah Drive AT144	✓ (1)	U	✓	✓	NO	✓	NO	✓	NO	POOR
Microtech International	NOVA 120	✓ (1)	I	NO	NO	NO	NO	NO	✓	✓	POOR
Northern Telecom	Memorybank SS400/MAC485	✓	I	✓	✓	NO	✓	NO	✓	✓	EXCELLENT
Northern Telecom	Memorybank SS400/MAC761	✓	I	✓	✓	NO	✓	NO	✓	✓	EXCELLENT
Peripheral Land	PL 140 Turbo	✓	I	✓	NO	✓	✓	✓	✓	✓	GOOD
Personal Computer Peripherals	IHD 144	✓(1)	U	✓	NO	NO	NO	NO	✓	✓	POOR
Priam	EM230 MacDisk	✓	U	NO	NO	NO	NO	NO	✓	✓	FAIR
Priam	EM330 MacDisk	✓	U	NO	NO	NO	NO	NO	✓	✓	FAIR
Relax Technology	Internal 172	✓	U	NO	NO	NO	✓	NO	✓	✓	FAIR
Relax Technology	H 300P	✓	U	NO	NO	NO	✓	NO	✓	✓	FAIR
Rodime	100 Plus	✓	I	✓	✓	✓	✓ (3)	NO	✓	NO	FAIR
Rodime	1000 RX	✓	I	✓	✓	✓	✓ (3)	NO	✓	NO	FAIR
Rodime	1400 RX	✓	I	✓	✓	✓	✓ (3)	NO	✓	NO	FAIR
SuperMac Technologies	DataFrame XP 150	✓	U	✓	NO	NO	✓	✓	✓	✓	EXCELLENT

1) Critical commands are not verified and can lead to serious mistakes.
2) MacZap utilities included.
3) FastBack backup utility included.

I = Intelligent
U = user selects CPU type

SUPPORT

Unless you happen to be extraordinarily lucky, at some point you may need to ask a question or get a drive repaired. The amount of support you can get from disk vendors varies widely.

Many manufacturers prefer to work primarily through dealers, which may work out for you if your dealer is particularly knowledgeable about the particular unit you're buying. Because large-capacity hard-disk drives are still a specialty item, however, you can't expect every dealer to be an expert about all common models.

If that's your situation, you'll find the availability of phone support particularly significant. When you're trying to install your hard-disk drive, being able to call up the manufacturer for help can be comforting.

Almost all the drives we tested provided a one-year warranty, but the exact provisions differed (see also sidebar, "Wiser to the Warranty").

Wiser to the Warranty

Every manufacturer's drives we tested offered one-year warranties except Relax, which has a four-month warranty. But what does the warranty really cover? Before you purchase a drive, you might want to find the answers to these questions:

- Do you have to send the drive back to the manufacturer, or can you return it to the dealer?
- Who pays for the shipping when the drive is returned?
- Do you get your drive back, or is it swapped for a refurbished drive?
- How do you have your hard disk serviced after the warranty has expired?
- Are extended service agreements offered?

SPECIAL FEATURES

Several of the drives we tested claimed one or more special features, in addition to the basics you need for everyday storage and retrieval. Not every user needs special capabilities, but if you do, it's nice to know that these features are available, at least on some units.

One of the most helpful features, although it means a significant increase in cost, is a built-in hardware-back-up system. It typically consists of a tape-drive unit that is part of the hard-disk unit, which you can use to make back-ups of the disk. Of course, you can also buy a separate tape-back-up unit and attach it to the SCSI chain (see "Back It Up!" in this issue).

Several of the units also have cache memories built into the drive controller. This feature allows the drive to save data that's likely to be read again in silicon chips as well as on its magnet-

Hardware Features

Manufacturer	Model	Advertised Size (Kilobytes)	Formatted Size (Kilobytes)	Manufacturer of Head Disk Assembly	Computer Compatibility	External Hard Disk INT/EXT	External Hard Disk Size, L×W×H (in inches)	External Hard Disk Weight (in lbs.)
CMS Enhancements	Pro140k-II/i	140,000	138,713	Rodime	II	INT	N/A	N/A
CMS Enhancements	Pro300-II/i	300,000	291,308	Control Data (1)	II	INT	N/A	N/A
FWB	hammer300	300,000	291,317	Control Data (2)	+,SE,II	EXT	10×9.5×5.5	12
Giga Cell Systems	Data Cell 150	150,000	150,236	Control Data (2)	+,SE,II	EXT	10×9.75×5.5	12
Giga Cell Systems	Giga Cell 290R	290,000	291,317	Control Data (1)	+,SE,II	EXT	11.25×7.25×12.25	20
Jasmine Technologies	Direct Drive 160	160,000	150,238	Control Data (2)	+,SE,II	EXT	10.25×10.25×4.5	20
Jasmine Technologies	BFD 8B	430,000	423,086	CDC & Toshiba	+,SE,II	EXT	28.25×11×28	80
MacProducts USA	Magic150	150,000	150,241	Control Data (1)	II	EXT	13×10.25×3.75	14
Micah Storage Systems	Micah Drive AT144	144,000	138,725	Various	+,SE,II	EXT	10.5×9.75×3	6
Microtech International	NOVA 120	120,000	117,529	Micro Science	+,SE,II	EXT	10.75×9.75×3.5	8
Northern Telecom	Memorybank SS400/MAC485	485,000	452,004	Northern Telecom	+,SE,II	EXT	24×10.25×22.25	86
Northern Telecom	Memorybank SS400/MAC761	761,000	741,380	Northern Telecom	+,SE,II	EXT	24×10.25×22.25	86
Peripheral Land	PL 140 Turbo	144,000	138,723	Rodime	+,SE,II	EXT	10×9.5×3.75	12
Personal Computer Peripherals	IHD144	144,000	136,726	Rodime	II	INT	N/A	N/A
Priam	EM230 MacDisk	230,000	236,612	Priam	+,SE,II	EXT	13.75×4.75×7.75	12
Priam	EM330 MacDisk	330,000	318,180	Priam	+,SE,II	EXT	13.75×4.75×7.75	12
Relax Technology	Internal 172	172,000	160,526	Century Data	II	INT	N/A	N/A
Relax Technology	H 300P	300,000	291,317	Control Data (1)	+,SE,II	EXT	13.25×10.25×4	15
Rodime	100 Plus	100,000	98,978	Rodime	+,SE,II	EXT	10.5×9.75×3	8
Rodime	1000 RX	100,000	98,978	Rodime	II	INT	N/A	N/A
Rodime	1400 RX	140,000	138,576	Rodime	II	INT	N/A	N/A
SuperMac Technologies	DataFrame XP 150	150,000	150,226	Control Data (2)	+,SE,II	EXT	9.5×5×8	11

1) Control Data's WREN 4.
2) Control Data's WREN 3.

ic platters. As a rule, all the units that had caching performed faster than those that did not have it.

COST

Cost might seem to be an easy factor to evaluate, but it's not enough merely to compare the list prices of the units. You also have to consider the actual selling price and the overall value.

The list price for each hard-disk unit is a good starting point for price comparisons, more than it is for smaller-capacity models. Because the market for these drives is not as large as that for smaller drives, you won't find as much price competition. Often, list price may be what you will end up paying for the bigger units.

If you shop around, however, you may be able to do better, but if you need support later, expect to pay for it either in the price or in a separate charge.

Remember, too, that within certain limits, more capacity or faster speed is proportionally inexpensive for the added benefit. When you get nearer to the limits of manufacturing technology and further into more specialized territory, though, costs can rise faster than the incremental capabilities (see "Price per Megabyte" chart).

MAKING THE SELECTION

If you need to minimize expenses, then you'll certainly pick the lowest-priced unit that meets your minimum requirements. If you have more latitude, you'll want to consider the charts and find the unit that best matches your particular set of optimal characteristics.

Several considerations simplify the decision when you're buying a large-capacity hard-disk drive.

Database users should consider a drive that will allow ample room for growth and alternate record/file systems. Check the size of your database at the *Finder* level of the desktop. Multiply this number by 2.5 to determine the recommended size for your drive. This size will allow ample room both to expand and manipulate the database, by either repairing or copying it.

Next, determine what sort of back-up requirements are best suited to your work environment. Whether your drive is for personal or corporate use, always remember to incorporate a regular schedule for backing up your data. The time you spend will more than pay off in the event of a disk crash.

Then consider your space requirements. If you have a Mac II, you may be interested in the several large-capacity drives that are available for internal mounting. If you have a Mac SE, you may want to consider desk models that you can place next to or under the computer. The larger floor models with built-in hardware back-up systems have easily expandable storage capacity and are also built to be industrially rugged.

If speed is not a critical issue, then

	External Hard Disk				Internal and External Hard Disks							
	Housing Materials	Front Panel Indicators	External Hard Disk Connector	Cooling Fan	Automatic Head Parking	Embedded SCSI Controller	Embedded SCSI Terminator	Changing SCSI ID Number	Hardware Back-up System	RAM Cache or Data Buffer	Warranty	Price
	N/A	N/A	N/A	N/A	✓	✓	✓	J	NO	N/A	1 year	$1,895
	N/A	N/A	N/A	N/A	✓	✓	✓	J	NO	N/A	1 year	$4,095
	Metal	✓	50 Pin	✓	✓	✓	✓	R	NO	N/A	1 year	$4,895
	Metal	✓	50 Pin	✓	✓	✓	✓	R	NO	N/A	1 year	$3,295
	Metal	✓	50 Pin	✓	✓	✓	✓	R (5)	✓ (8)	N/A	1 year	$8,795
	Metal	✓	50 Pin	✓	✓	✓	NO	T	NO	16K	1 year	$2,899
	Metal	(3)	50 Pin	✓	✓	✓	✓	D	✓ (9)	512K to 16MB	1 year	$17,995
	Metal	✓	50 Pin	✓	✓	✓	NO	J	NO	N/A	1 year	$1,950
	Metal	✓	50 Pin	✓	✓	✓	NO	R	NO	8K	1 year	$1,999
	Metal	✓	50 Pin	✓	✓	✓	NO	D	NO	N/A	1 year	$2,424
	Metal	(4)	50 Pin	✓	✓	✓	✓	P, D (6)	✓ (9)	N/A	2 year (10)	$13,600
	Metal	(4)	50 Pin	✓	✓	✓	✓	P	✓ (9)	N/A	2 year (10)	$15,900
	Metal	✓	50 Pin	✓	✓	✓	NO	R	NO	N/A	1 year	$2,995
	N/A	N/A	N/A	N/A	✓	✓	✓	J	NO	N/A	1 year	$2,895
	Metal	✓	50 Pin	✓	✓	✓	✓	T	NO	N/A	1 year	$3,995
	Metal	✓	50 Pin	✓	✓	✓	✓	T	NO	N/A	1 year	$4,895
	N/A	N/A	N/A	N/A	NO	✓	✓	J	NO	1K	120 DAYS	$3,995
	Metal	✓	25 Pin	✓	✓	✓	NO	J	NO	32K	120 DAYS	$4,995
	Plastic	✓	50 Pin	✓	✓	✓	NO	R	NO	4K	1 year	$2,295
	N/A	N/A	N/A	N/A	✓	✓	✓	J	NO	4K	1 year	$2,195
	N/A	N/A	N/A	N/A	✓	✓	✓	J	NO	4K	1 year	$2,495
	Metal	✓	25 Pin	✓	✓	✓	NO	(7)	NO	N/A	1 year	$3,295

3) Full suite of LEDs to indicate drive activity.
4) Fault, power, and ready LEDs.
5) Can change ID for Hard Disk and removable media.
6) External pushbutton for Hard Disk, internal DIP switch for tape drive.
7) Software only.

R = rotary
J = jumper strap (internal)
P = pushbutton
D = DIP switch
T = thumbwheel

8) Rigid 5¼-inch disk.
9) DC600 Tape Back-up (N. Telecom will go from 75MB to 150MB tape).
10) Two years on disk, one year on electronics.


Macintosh II
microExplorer
microExplorer



Look what happened when Texas Instruments and Apple® put their heads together.

Introducing microExplorer™. The AI computer for all of us.

Computers designed for symbolic processing have long been recognized as providing the performance and sophisticated software environments needed to develop complex artificial intelligence applications. But volume delivery of these applications often requires computers that are smaller, lower in price and that can also run a broad range of conventional applications.

Now, for the first time, there's a computer that meets these needs. The new microExplorer from Texas Instruments.

Combining the power of Explorer™ and Macintosh® II.

The microExplorer combines the capabilities of Apple's widely acclaimed Macintosh II personal computer and TI's Explorer AI workstation. You can run the same system software and powerful knowledge-based software environments as the Explorer. You can also run the more than 3,000 conventional applications written for the Macintosh. What's more, you can run both software environments concurrently, so that applications can be developed integrating the capabilities of both.

Two computers in one.

In addition to the Mac II's 32-bit processor, the microExplorer features the same powerful microprocessor used in the Explorer II, the world's most powerful symbolic processing workstation. TI's Explorer Lisp chip, the world's first microprocessor optimized for AI applications, packs over 500,000 transistors into a single square centimeter.

The microExplorer's multiprocessor design is made possible by Apple's choice of TI's advanced NuBus™ architecture for the Mac II. Operating concurrently, the two processors provide you with unprecedented power in a desktop computer.



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Major Hard Disk Components and Improvements:

Here we have identified some of the major components of a hard disk drive with accompanying descriptions of the technological advancements that provide hard disk users with greater reliability, performance, and storage capacities.

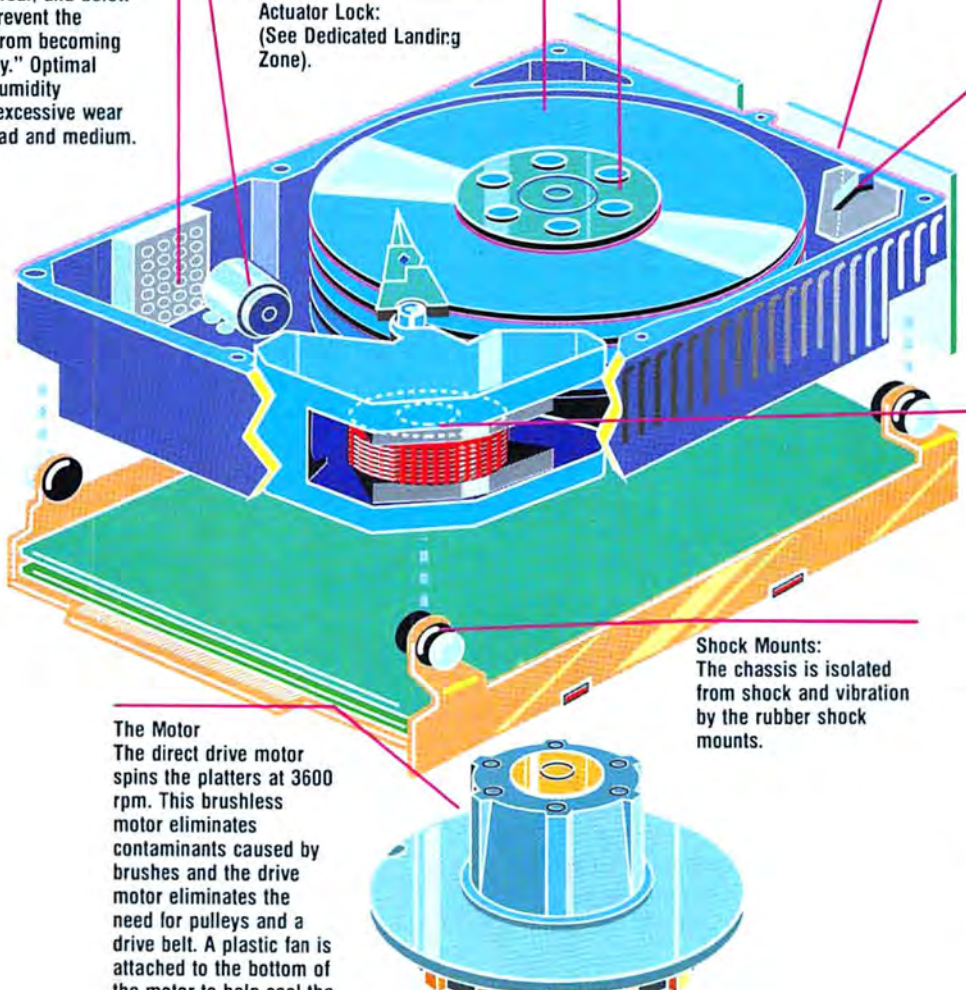
Desiccant Drawing Block:
The desiccant pack, which is impregnated with activated charcoal, absorbs moisture and controls relative humidity within the chassis. The desiccant drying agent keeps the humidity in the head-disk assembly above 10% to prevent medium wear, and below 30% to prevent the medium from becoming too "sticky." Optimal relative humidity prevents excessive wear on the head and medium.

Platters:
The capacity of the hard disk is proportional to the number of platters and how densely the data is recorded. The density of data is improved with thin-film read/write heads and high-density media. The aluminum substrate of the platter is coated with nickel alloy for hardness and smoothness. Then a cobalt-nickel-chromium magnetic material is added to the platter, and finally a carbon overcoat to prevent corrosion.

Dedicated Landing Zone:
The heads fly at 10 to 12 micro-inches above the surface of the medium. At power-down, the heads are driven to a dedicated landing zone within the inner radius, where data integrity is not jeopardized by the head contacting the medium when power is turned on. Whenever a loss of power occurs or the drive is powered down, the actuator lock automatically directs the heads into the dedicated landing zone.

Chassis:
The case helps dissipate heat caused by the platter spinning at 3600 rpm. If heat is not dissipated, the interior metal parts could expand, causing a misalignment of the head on the data track. The case is also sealed in a "clean" room to make certain no dust interferes with the head traveling over the spinning platters.

Actuator Lock:
(See Dedicated Landing Zone).

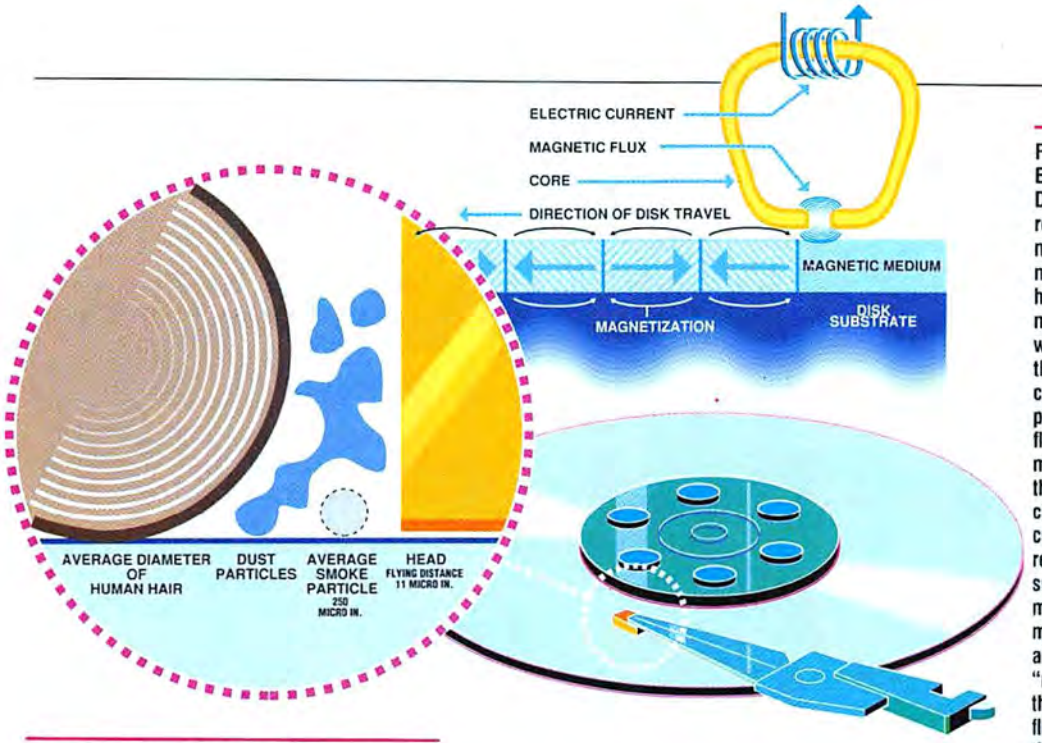


Air Filter:
The head-disk system is in a sealed chassis to prevent outside contaminants from entering the case. The air filter permanently traps particles inside the chassis that are produced by wear and tear.

Voice Coil Actuator:
The voice coil actuator assembly consists of the actuator arm, the magnetic housing assembly, and the voice coil. The combination of the magnetic housing assembly and the electromagnetic voice coil moves the actuator arm across the disk from the outer-to the innermost tracks in a single motion. Other systems use stepper motors that move the head one small increment at a time until the desired track is reached; this technique is also less accurate and reliable due to the number of mechanical parts involved.

Shock Mounts:
The chassis is isolated from shock and vibration by the rubber shock mounts.

The Motor
The direct drive motor spins the platters at 3600 rpm. This brushless motor eliminates contaminants caused by brushes and the drive motor eliminates the need for pulleys and a drive belt. A plastic fan is attached to the bottom of the motor to help cool the circuit boards.

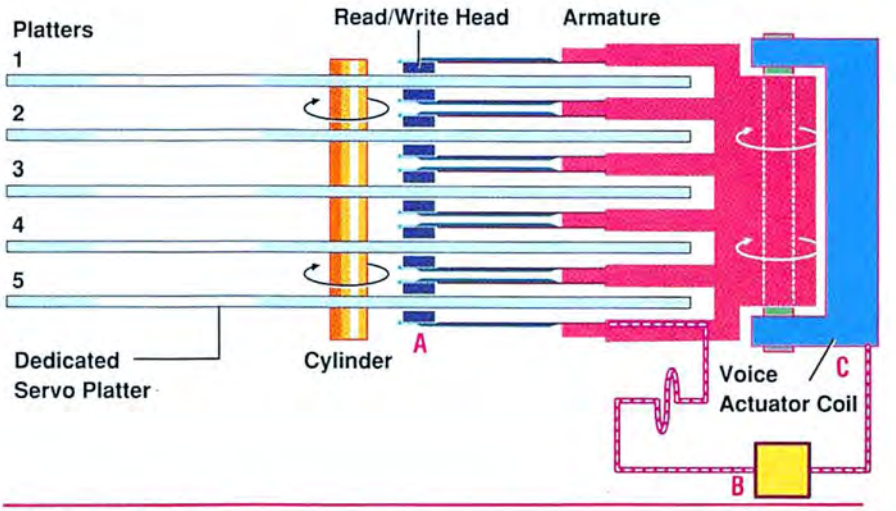


READING AND WRITING ELECTROMAGNETICALLY

Data is stored on the surface of a rotating 3600 RPM platter by the magnetization of regions of the magnetic material. The read/write head is, in its simplest design, a magnetizable core wrapped with wire. When current is applied to the wire, a magnetic flux is created at the core's gap. As the platter moves under the head, the flux magnetizes the underlying magnetic surface. The direction of the magnetization is reversed by changing the direction of the current through the wire; these reversals correspond to a succession of 0's and 1's that make up bits of data. These same magnetic flux lines extending above the surface of the media are "read" by the head. As the core of the head passes over the changing flux lines, a current is induced in the coil of the wire and is translated into bits of data.

FLYING DISTANCE AND CONTAMINATION

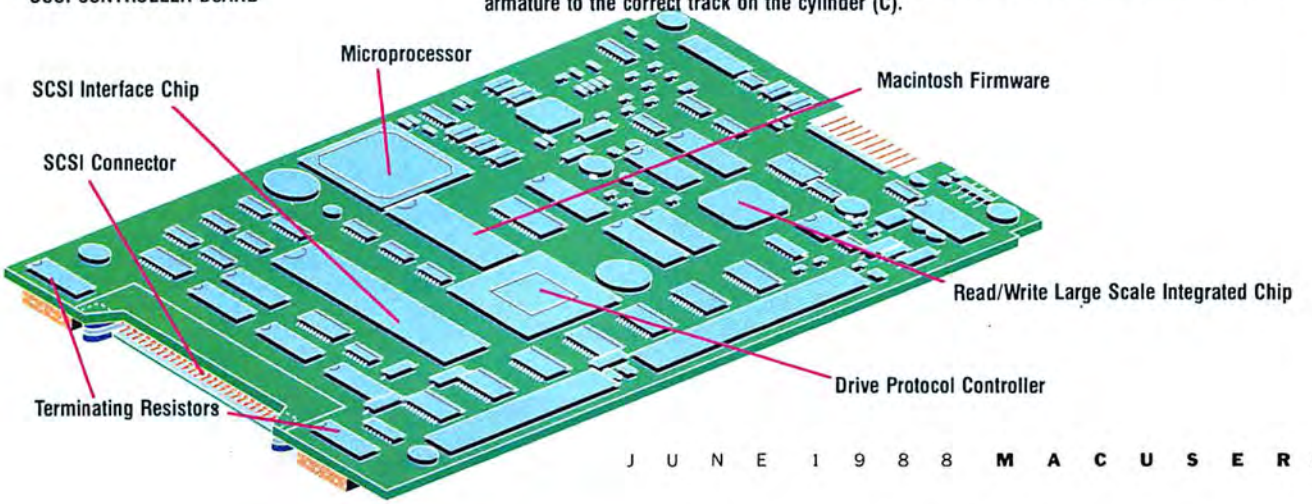
The read/write heads fly on a very thin layer of air that is squeezed between the head and the disk. A smoke or dust particle is like a boulder to a head flying 10 to 12 micro-inches above a platter spinning at 3600 RPM. That's why the head-disk-assembly is assembled in a room with less than 100 particles per cubic foot and why the head-diskassembly is contained in a sealed chassis. If the head should encounter a particle on the surface, it could possibly careen off the particle, crash into the surface of the disk, and possibly chip off a piece of the magnetic material.



FASTER HEAD POSITIONING:

Some of the tested drives use a dedicated servo system that provides faster read/write head-positioning on the cylinders. The dedicated servo head on the bottom platter reads two prerecorded signals from the dedicated servo platter (A). These signals define head positioning. The servo microprocessor monitors the signals (B) and in turn activates the voice coil, which moves the armature to the correct track on the cylinder (C).

SCSI CONTROLLER BOARD



Price per Megabyte

(by order of price per megabyte)

Manufacturer	Model	Finder Size (MBs)	Price	$ per MB
CMS Enhancements	Pro140k-II/i	139	1,895	12.94
CMS Enhancements	Pro300-II/i	291	4,095	14.06
Micah Storage Systems	Micah Drive AT144	139	1,999	14.41
Priam	EM330 MacDisk	318	4,895	15.38
MacProducts USA	Magic 150	105	1,950	16.63
FWB	hammer300	291	4,895	16.80
Priam	EM230 MacDisk	237	3,995	16.88
Relax Technology	H 300P	291	4,995	17.15
Rodime	1400 RX	139	2,495	18.00
Jasmine Technologies	Direct Drive 160	150	2,899	19.30
Microtech International	NOVA 120	118	2,424	20.84
Personal Computer Peripherals	IHD144	137	2,895	21.17
Northern Telecom	Memorybank SS400/MAC761	741	15,900	21.45
Peripheral Land	PL 140 Turbo	139	2,995	21.59
SuperMac Technologies	DataFrame XP 150	150	3,295	21.93
Giga Cell Systems	Data Cell 150	150	3,295	21.97
Rodime	1000 RX	99	2,195	22.18
Rodime	100 Plus	99	2,295	23.19
Relax Technology	Internal 172	161	3,995	24.89
Northern Telecom	Memorybank SS400/MAC485	452	13,600	30.09
Giga Cell Systems	Giga Cell 290R	291	8,795	30.22
Jasmine Technologies	BFD 8B	423	17,995	42.53

check current prices for the best deal in terms of storage capacity and price.

As a result of our testing and experience, we recommend the following drives. We've separated them into two groups, with storage capacities of around 150MB and 300MB. These are only recommendations. When you're selecting a drive, only you can determine what your exact needs are, and you should discriminate carefully, as you would in any major purchase of a computer peripheral.

The Giga Cell 290R is the clear leader in price/performance and is available with a choice of disk or tape back-up. It has excellent software and can fit on the desktop near your computer.

The FWB hammer300 also offers an excellent array of software, and, although it does not include a hardware back-up system, it is much less expensive than the 290R. The CMS Pro300II/i is the only internal disk in the 300 MB range. It also includes a good selection of software.

If you're looking in the 150MB range, then the MacProducts USA Magic Drive, at 150 MB, offers the highest performance at a very competitive price.

Resources

Books

- *Hard Disk Management for the Macintosh* by Nancy Andrews. Bantam Computer Books, 1987.
- *Macintosh Hard Disk Management* by Ben Calica. Sams, 1988.

SCSI Documentation

- Apple Technical Notes: Available from APDA (206) 251-6548. (For specific information, refer to Apple Technical Notes 94, 96, 113, 134, and 159.)
- SCSI Manager Chapters, *Inside Macintosh* Volumes IV and V from Addison Wesley.
- *American National Standard Committee SCSI Standard*

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- Gary Henry and Diane Wilde, MacUser Labs, testing technicians;
- Kim Bednash, MacUser Labs, administrative support;
- David Terry, Acius, 4th Dimension product support;
- Wingz wizards, Informix Software, who provided a pre-release version of Wingz to generate our 3-D bar chart of test results.

Hard Disk Fact Sheet

CMS Pro140k-II/i

The CMS Pro140-II is an internal drive for the Mac II. Physical installation is trouble-free, and the only tool required is a Phillips-head screwdriver.

The software provided includes format, initialize, SCSI ID, install new drivers, and park. Software is easy to use, and the documentation is quite clear and well laid out. The back-up software is the standard Apple hard drive back-up program. Utilities include INIT PRAM FIX and ZAP PRAM, which repairs the desktop in case it should crash from an overload of files. The utilities pull-down menu headings are File, Info, Test, Model, Help, and Advanced. The programs are fairly comprehensive and Mac-easy to use. CMS offers no telephone technical support, so you must go to your dealer if you have any problems.

The CMS Pro140k-II/i retails for $1895. On overall speed, it tested in the slow mid-range on the Mac II.

CMS Pro300-II/i

The CMS Pro300-II is a full-size 300 MB internal drive for the Mac II. Physical installation requires adding a supplied special bracket to the inside of the Mac II. You must remove the internal floppy drive(s) and remount the floppy(s) on this bracket along with the hard drive. The manual provides clear and concise installation instructions. The only tool required is a Phillips-head screwdriver and all work must be done on a padded surface.

The software provided includes format, initialize, SCSI ID, install new drivers, and park. The software is easy to use and the documentation is quite clear and well laid out. The back-up software is the standard Apple hard drive backup program. Utilities include INIT PRAM

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FIX and ZAP PRAM, which repairs the desktop in case it should crash from an overload of files. The utilities pull-down menu headings are File, Info, Test, Model, Help, and Advanced. The programs are fairly comprehensive and Mac-easy to use. CMS offers no telephone technical support, so you must go to your dealer if you have any problems.

The CMS Pro300-II/i retails for $4095 and was the fastest *internal* drive on the Mac II, finishing six places ahead of the closest internal drive and coming in second overall, just 20 seconds slower than the first place winner, the hammer300, which costs an additional $800.

FWB Software hammer300

The hammer300 has the same footprint as an SE, but it sits 5½ inches high, so unless you want a long-tall Mac, you might find it a bit high to put under your SE. The drive case is



Macintosh-gray and has an attractive, simple design with a green ON light and a red Read/Write light. It has tiny air vents in a seam that runs around the drive on a horizontal plane.

The manual is helpful and is well-illustrated, with diagrams and dialog boxes showing what the screen actually looks like throughout a given procedure. Phone support is also excellent.

FWB provides a generous supply of handy software, including a *Hammer Install* program that formats, initializes, partitions, and tests the driver, and is Mac-easy to use. The back-up program is *Omni Backup* by NuData.

Utilities include Recover Prams, Hard Disk Recover, Hard Drive Optimizer, an organizer utility, as well as Cell spool, a LaserWriter spooler, and LaserSpeed, which installs the spooler.

One interesting program is called *Patches;* it includes 85 application patches of 2K each that allow you to run copy-protected software on the hard drive without inserting the original floppy. There's also a file manager utility that will erase, delete, get info, erase disk, etc. Sample copies of *MacDraw, Microphone,* and *Fedit Plus* 1.07 are also included.

At a retail price of $4895 for 300 MB of storage, this is a good value. This was the fastest of all the drives tested on the Mac II, and it came in third on the SE. So, for overall speed and performance, supplied software, and ease of use, we really liked and can heartily recommend the hammer300.

Giga Cell Data Cell 150

The Data Cell 150 is housed in a Mac-gray aluminum, scratch-resistant case that is 5½-inches tall and approximately 10 inches in both width and length. It could go under a regular



Mac, if you don't mind the extra height, or at the side. The front panel has an On/Off switch and indicator lights for both On/Off and Read/Write.

The supplied software includes *GigaInstaller,* which updates and installs the driver, sets SCSI addresses, helps, formats, tests, and partitions. Utilities include *Data Express;* a file organizer; and *Cell Spool,* a print spooler. The installer software does not appear on the screen like a usual Mac interface. There are dialog-type boxes with a small Help section that you can scroll through *if you read the manual* to learn how it works. There is nothing on-screen that makes the process obvious. The back-up utility is *Omni Backup* by NuData, and a well-written manual is supplied to explain the back-up procedure.

The Data Cell 150 retails for $3295. It was the slowest drive on the SE and fourth slowest on the Mac II.

Giga Cell Giga Cell 290R



The Giga Cell 290R is a large (11 x 7 x 12-inch), vertical standing desktop hard disk drive with a 10 MB, 5¼-inch rigid floppy back-up unit in the front panel. There are separate sets of indicator lights for the hard disk and the back-up unit for both On/Off and Read/Write.

The supplied software includes *GigaInstaller,* which updates and installs the driver, sets SCSI addresses, helps, formats, tests, and partitions. Utilities include *Data Express;* a file organizer; and *Cell Spool,* a print spooler. The installer software does not appear on the screen like a usual Mac interface. There are dialog-type boxes with a small Help section that you can scroll through *if you read the manual* to learn how it works. There is nothing on-screen that makes the process obvious. The back-up utility is *Omni Backup* by NuData, and a well-written manual is supplied to explain the back-up procedure.

The Giga Cell 290R retails for $8795 and was far and away the fastest drive on the SE, finishing a full 190 seconds faster overall than its closest competitor, the Priam 330. However, its performance on the Mac II was in the slow mid-range. This drive is trouble-free and easy to use. It is also very quiet and very fast if you're planning to use it with an SE.

Jasmine BFD 8B

The BFD 8B is a large, file-server-type hard disk housed in a two-toned (tan and cream-colored) floor unit 28 inches tall, 11 inches wide, and 28 inches long, with rather sticky rolling casters. It has a streaming-tape back-up unit in the front panel that will back-up 150 MB per cartridge. The front panel was more lit up than any of the other units, with a long horizontal bar of flickering, flashing LEDs and buttons that light up for the back-up unit and disk operation, both On/Off and Read/Write. The BFD 8B is Apple-, UNIX-, and IBM-compatible.

The supplied software includes installation programs that let you set SCSI ID and LUN (Logical Unit Number), mount volumes, and initialize the disk. When first starting up, it's essential to follow the tutorial on page ten of the manual, or the drive won't start at all. The tutorial is good and easy to use if followed to the letter. This points to some minor faults with the software with regard to the standard Mac interface. As soon as you open the installer icon, you need to refer to the manual in order to determine what to do next, since there is no dialog box on the screen. The manual is quite good, with lots of handy diagrams and illustrations, and it explains the issue of SCSI ID very clearly in an attention-getting boxed Note. Fifty pages of the 100-page manual are required to describe the back-up procedure. Supplied utilities include a desk accessory and font mover.

Other features include partitioning/volume modification, files the size of the disk with no 32 MB limit, volume password-protection with read/write/share attributes, and partition linking.

The BFD 8B retails for $17,995, the most expensive of the drives tested, but its speed performance on both the SE and the Mac II was in the slow mid-range.



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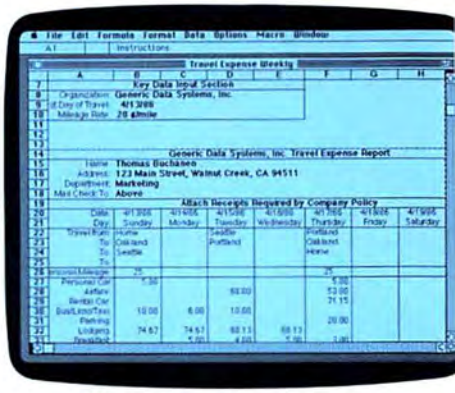
Only people who



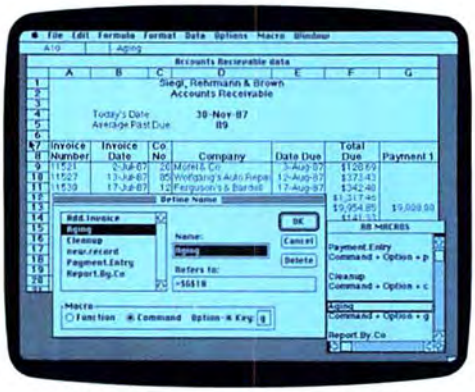
Pay taxes.



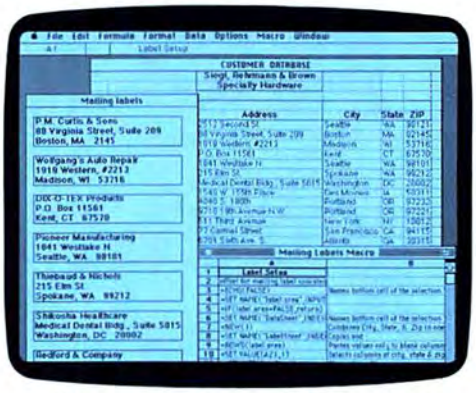
Evaluate engine efficiencies.



Prepare expense reports.



Manage accounts receivable.



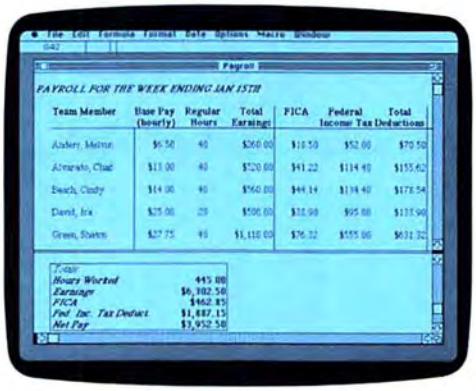
Manage customer information.



Analyze market trends.



Invest in stocks.



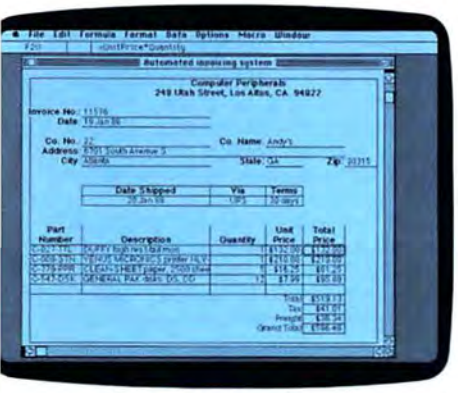
Manage the payroll.



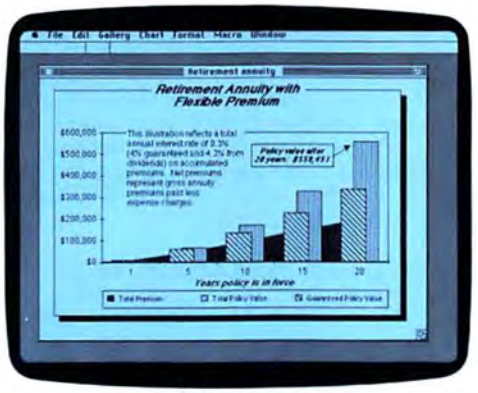
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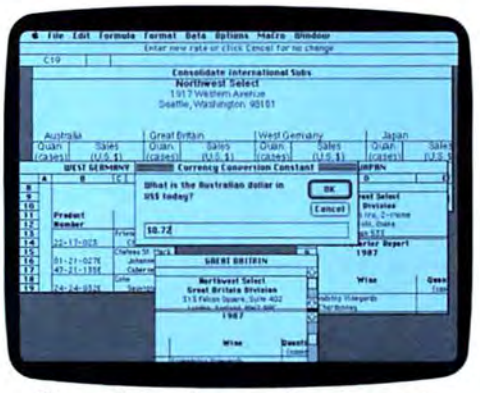
do things like this.



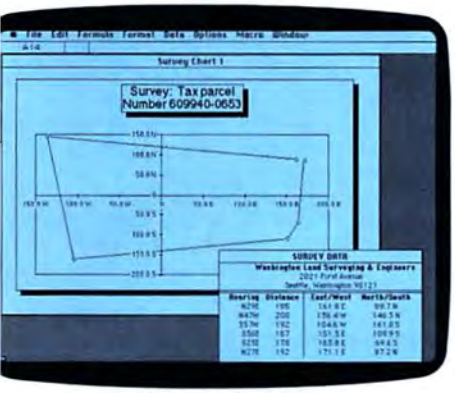
Generate invoices.



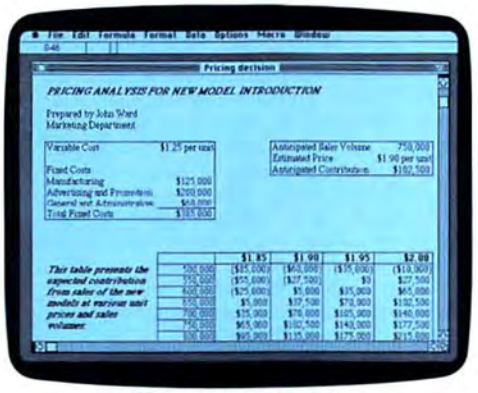
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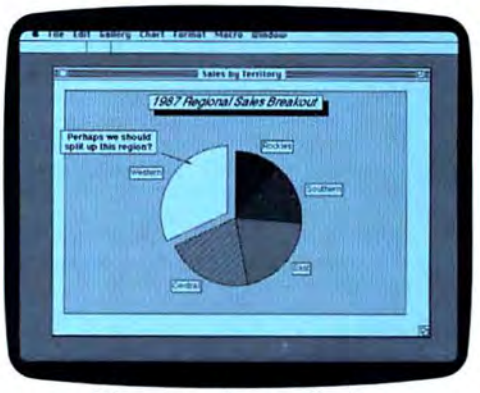
Consolidate international reports.



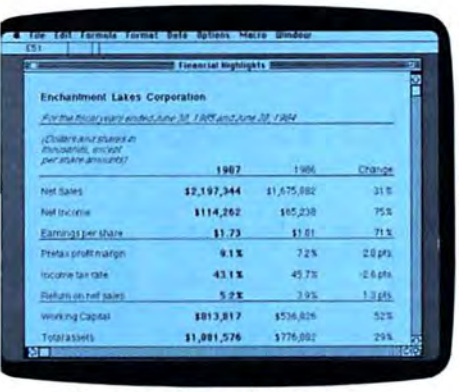
Survey land.



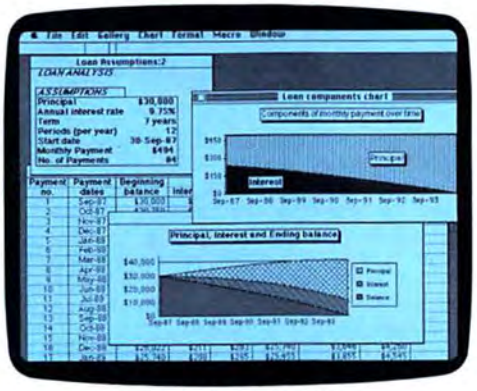
Make pricing decisions.



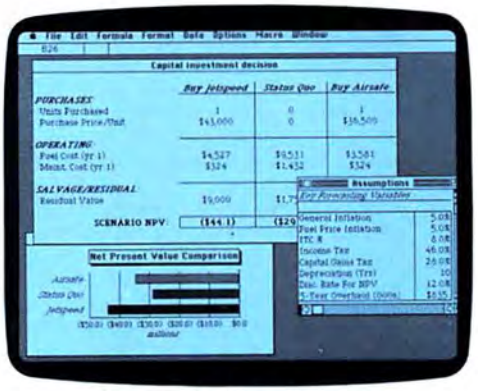
Manage sales territories.



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Jasmine Direct Drive 160

The Jasmine 160 is a 4½-inch tall desktop hard disk with a Macintosh footprint. It has a Read and Write light on the front panel and two A/C power outlets on the back panel. Jasmine incorporates an air filter along with the cooling fan to help keep the inside of the case dirt-free. The fan tested was one of the noisiest ones on our decibel meter, but due to its relatively low pitch, it didn't seem especially irritating to our ears.

Jasmine provides a generous supply of software. It includes format, install, SCSI ID scan, mount, back-up, and first aid programs, along with *MacTREE*, a utility for organizing and managing files; *MacZap*, a collection of programs for recovering files from corrupted disks and removing copy protection from applications; and *ResEdit*, a resources editing utility. There are also 10 MB of nine different types of public domain/shareware (utilities, graphics, stackware, and games) that appear to be well documented and useful. The manual and the set-up process are both Mac-easy. The manual is well written, easy to comprehend, and includes "A Technical Peek Inside" for those who want to explore the more technical aspects of the drive.

The Jasmine Direct Drive 160 retails for $2899. It finished in the fast mid-range on the speed tests on both the Mac II and the SE. At that price, about the same as some of the smaller drives, the Direct Drive 160 looks like a good buy.

MacProducts Magic 150

The Magic 150 is a 13-inch by 10-inch by 4-inch drive which, at 14 pounds, weighs in a bit on the heavy side for a desktop unit. It has four LED toggle switches on the front panel and four A/C outlets on the rear panel in addition to the A/C power connector. The unlabeled A/C outlet next to the power connector is linked to the drive with the power switch, so that you could hook your computer directly to the drive and turn both the drive and the computer on with one switch. There is a Read/Write light on the front panel. The SCSI connectors are the 25-pin type, unlike most of the other drives, which use the 50-pin connector.

The software provided includes install, mount, reformatting, testing, and parking. *MacZap*, a collection of programs for recovering files from corrupted disks and removing copy protection from applications, is also provided. This drive and software are very similar to the Relax 300, but MacProducts has done a better job on the manual, which includes information about other support programs, public domain software and shareware, bulletin board systems, and some ID bomb numbers, and what to do about them.



At a retail price of $1950, the Magic 150 is the least expensive of the external drives in this megabyte category. Since it achieved speed ratings of fourth fastest on both the Mac II and the SE, it appears to be an excellent price/performance contender.

Micah Storage Micah Drive AT144

The Micah Drive AT144 is a small, Macintosh-gray, metal-cased desktop hard drive with a footprint the size of a Mac SE. It has no indicator lights of any kind.

The software provided includes Micah Manager, which formats, scans, and repairs; updates the driver; initializes the disk; and provides a help function. The format portion can be a bit dangerous since it has no "fail safe" margin built into the function. At the beginning of the testing procedure on the Mac II, while we were attempting to install the drivers, the software reformatted one Mac II internal hard drive without any warning or cancel option of any kind appearing on the screen. After spending several hours trying different methods based on suggestions from the manufacturer, and using another Mac II, we were never able to boot the disk on the Mac II. We did not experience any of these problems while using the Micah AT144 with the SE.



A major cause of this problem is the fact that the manual does not explain SCSI ID so that, since the SCSI ID of the Mac II was set at 0, it was the first drive the formatting software picked out. The fact that there is no notice, either in the manual or on a dialog box, to warn you of what could happen, points to a major flaw in both the software and the documentation.

Micah supplies a back-up program by PBI Software that backs up files by volume and function, changes files, copies single files, shows the time required to perform a back-up, and restores files singly or as a group.

A file organizer and a security utility are also included.

The Micah AT144 retails for $1999 and has a one-year warranty. The SE was the only machine we were able to boot it on, and its relative overall performance was quite slow. We don't recommend this drive unless the manufacturer can solve some of the problems it has operating with the Mac II.



Microtech International NOVA 120

The NOVA 120 is a rather undistinguished looking drive with some rather scary features. It is cased in an under-the-Mac-type, Mac-gray metal housing and has one light that is used as both an On light and a Read/Write light. Its fan is a bit noisier than most.

The software package consists of a NOVA Format program that installs and initializes the disk (be careful here). There is no utilities diskette. Microtech also supplies several standard Apple applications, including *MultiFinder*.

When we tried to start the hard disk on an SE with an internal hard drive, no icon showed on the screen for either hard disk. We checked the manual, which tells you to set the SCSI ID of the Nova at 0. Once again, *this is a problem*. Since the Mac's hard disk SCSI is also set at 0, no hard drive icon appeared at all, either for the Mac drive or the NOVA 120. (See SCSI sidebar.) When you open the format icon on the diskette, there is no "about" box available to explain anything. And, *Horrors!* When we selected a drive and a model number and clicked on INSTALL, the program immediately started a procedure without asking any further okays from us — almost immediately a small dialog box appeared that read, "Initialization was successful," even though INSTALL was the choice and another button is labeled INITIALIZE. The procedure that had been performed was the reformatting of our Mac SE's internal hard disk.

The NOVA 120 retails for $2424. After we disconnected our internal hard drives on both the SE and the Mac II and finally got the NOVA 120 going, its overall speed performance was in the mid-range on the SE and fifth slowest on the Mac II. Later, when we hooked the disk up to an SE with only floppy drives and no internal hard disk, we experienced no difficulties getting it going.

Northern Telecom Memorybank SS400/MAC 485

Northern Telecom's Memorybank SS400/MAC 485 MB drive is a large 86-pound floor model hard disk with smooth rolling casters for ease of movement. Its attractive Macintosh-gray metal case has beveled edges and is built to be shock-resistant. It has three indicator lights on the front panel for Power, Fault, and Ready. This Northern Telecom unit contains a 75 MB streaming-tape back-up system that is hidden inside the front panel of the drive and is accessible with a handy push-bar opener on the top. An opened front panel reveals a slot for the tape, a Write-Protect button, and a Disk Reset button. Hooking up the unit is very simple.

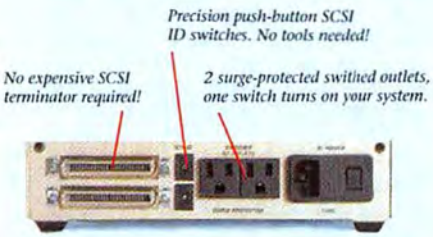
The installer software is a multipurpose program that performs all housekeeping func-

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tions from volume selection to tape back-up; an excellent Mac-easy utility. The manual wasn't actually needed to get the hard disk set up, but it is very well done. All back-up is done from the utility called Manager under a section called "tape." Buttons are EDIT, BACK-UP, VERIFY, RESTORE. When you click on any button, a new dialog box appears for the next function.

The $13,600 retail price includes tape for the back-up unit and a generous two-year warranty on the disk drive with a one-year warranty on all other electronics. The drive itself has an 8-inch platter compared to the 5½-inch platters on most other drives in our test group. This partially explains why the Memorybank 485, even with its large memory storage capacity, did not perform as fast as some of the other drives. Its overall speed performance was in the slow mid-range on both the Mac II and the SE.

Northern Telecom Memorybank SS400/MAC 761

Northern Telecom's Memorybank SS400/MAC 761 MB drive is a large 86-pound floor model hard disk with smooth rolling casters for ease of movement. Its attractive Macintosh-gray metal case has beveled edges and is built to be shock-resistant. It has three indicator lights on the front panel for Power, Fault, and Ready. This Northern Telecom unit contains a 75 MB streaming-tape back-up system that is



hidden inside the front panel of the drive and is accessible with a handy push-bar opener on the top. An opened front panel reveals a slot for the tape, a Write-Protect button, and a Disk Reset button. Hooking up the unit is very simple.

The installer software is a multipurpose program that performs all housekeeping functions from volume selection to tape back-up. This is an excellent Mac-easy utility. The manual isn't actually needed to get the hard disk set up, but it is very well done. All back-up is done from the utility called Manager under a section called "tape." Buttons are EDIT, BACK-UP, VERIFY, RESTORE. When you click on any button, a new dialog box appears for the next function.

The $15,900 retail price includes tape for the back-up unit and a generous two-year warranty on the disk drive with a one-year warranty on all other electronics. The drive itself has an 8-inch platter compared to the 5½-inch platters for most other drives in our test group. This partially explains why the Memorybank 761, even with its large memory storage capacity, did not perform as fast as some of the other drives. Its speed performance was fifth fastest on the Mac II and fifth slowest on the SE.

Peripheral Land PL 140 Turbo

The PL 140 Turbo is a small, Macintosh-gray, metal-cased desktop hard drive with a footprint the size of a Mac SE. It has no indicator lights of any kind.



The formatting software lets you select SCSI ID, format the disk, cancel formatting, and install and partition the driver. There is a volume mount utility that must be installed as a desk accessory, and a disk timer utility that times aspects of the disk's function. However, the disk timer does not inform you in advance that timing may take quite awhile, and it leaves you no means of escape once you have started timing. When icons have been opened on the desktop beyond the first level and you close a file, the software closes the windows back into the diskette icon automatically, so you have to keep reopening the diskette.

The manual is sketchy and confusing. For example, it tells you to copy "your software" without specifying that that means the utilities software, and without first telling you to insert the utilities disk. Also, the manual tells you to set the SCSI ID for the Peripheral Land drive at 0, but before we even had a chance to check the SCSI ID, the utilities disk reformatted the SE internal drive, since the SE is delivered with its SCSI ID set on 0 and the PL 140 was also set on 0. The utilities disk began this procedure on insertion only *without any request for instructions whatsoever.* This is a major flaw that could produce a small-scale disaster for some unsuspecting user who expects consistent "fail-safe" procedures and user-friendliness from the Macintosh.

The PL 140 Turbo retails for $2995. We can only say, be very careful with this one; you may need to make use of the one-year warranty. We can't really recommend it.

Personal Computers Peripherals IHD 144

The IHD 144 is a half-height 144 MB internal hard disk drive for the Mac II. Physical installation is very easy, and the only tool required is a Phillips-head screwdriver.

Provided software includes an installation program that formats, initializes, and tests the disk; and *SCSI Tools,* a separate utility in the *System* folder that can be used in conjunction with PCPC's customer service phone number to install drivers and set SCSI IDs. The back-up program is *HFS Backup* 2.02, and the program, *Floppy Copy,* lets you quickly transfer the contents of one floppy to another. A desk accessory, *Eureka D/A,* allows you to rapidly locate misplaced files. The utilities include *MB Laser* and *MB Spooler,* which free up time waiting for the LaserWriter and ImageWriter. The manual is small but clearly written and well laid out. Technical phone support is excellent.

The IHD 144 retails for $2895. Its overall speed rating was right in the middle. We found this to be the overall best and the easiest to use of all the internal disk drives. We left it in the Mac II while cleaning up the systems on all the other drives.

Priam EM230 MacDisk

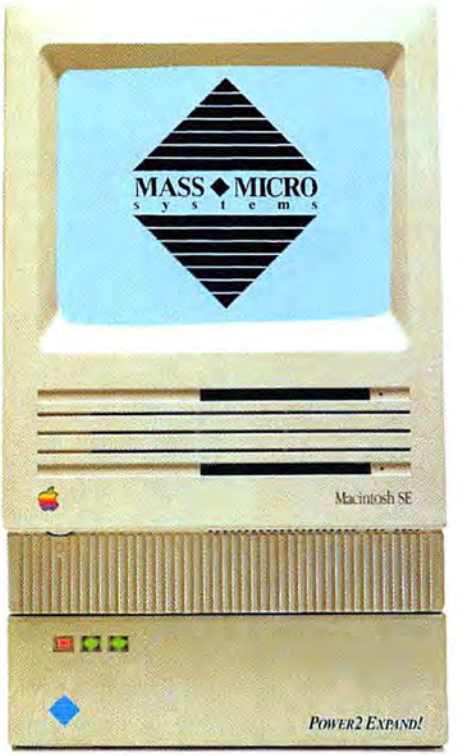
The EM230 MacDisk is an 8-inch tall vertical standing unit that is almost 14 inches long and about 5 inches wide. It has both Power and Read/Write lights on the front panel. The On/Off switch is placed on the rear panel between cable connectors, which makes it rather awkward to reach. Although this disk did not register as particularly noisy on our instruments during the sound test, the fan does seem to have a high-pitched frequency that is more noticeable to the ear than most others.

MacDisk software is relatively minimal. It includes an installation program, edit drive, test drive, erase drive, and a function that lets you set the SCSI address. Priam's documentation is very good and includes helpful diagrams and illustrations showing set-up and installation procedures. The comments about setting



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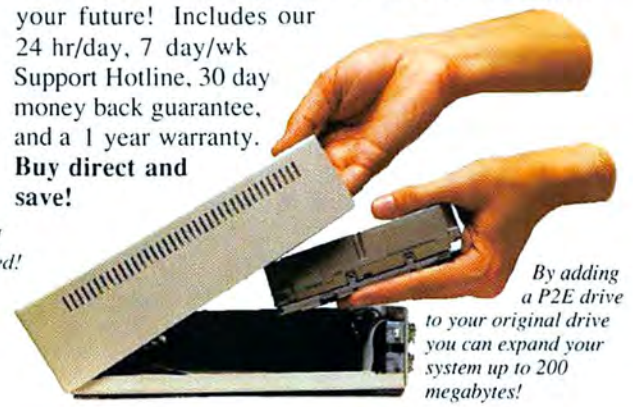
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SCSI ID are correct and informative, and the manual contains well-written sections on installation, operation, and troubleshooting.

The Priam MacDisk EM230 retails for $3995 and has a one-year warranty. It finished in the mid-range in overall speed on the SE and third slowest on the Mac II.

Priam EM330 MacDisk

The EM 330 MacDisk is an 8-inch tall vertical standing unit that is almost 14 inches long and about 5 inches wide. It has both Power and



Read/Write lights on the front panel. The On/Off switch is placed on the rear panel between cable connectors, which makes it rather awkward to reach. Although this disk did not register as particularly noisy on our instruments during the sound test, the fan does seem to have a high-pitched frequency that is more noticeable to the ear than most others.

MacDisk software is relatively minimal. It includes an installation program, edit drive, test drive, erase drive, and a function that lets you set the SCSI address. Priam's documentation is very good and includes helpful diagrams and illustrations showing set-up and installation procedures. The comments about setting SCSI ID are correct and informative, and the manual contains well-written sections on installation, operation, and troubleshooting.

The Priam MacDisk EM330 retails for $4895 and has a one-year warranty. It finished second in overall speed on the SE and sixth on the Mac II.

Relax Technology H300P

The Relax H300P is 4 inches high, 10 inches wide, and 13 inches deep, which makes its footprint slightly larger than a Mac. The front panel has four switches that connect to the four grounded A/C outlets on the back of the unit. One of the outlets is for the hard drive itself, and the others can be used to connect other drives or peripherals. This drive is the only one we tested that uses 25-pin SCSI connectors; most use a 50-pin connector on the drive end with 25 pins on the Mac end. The H300P is compatible with the whole Mac family, but since it will not boot the Mac Plus, it can only be used as a second hard drive with the Plus.

The software provides mounts, updates, reformats, tests, and parks the drive. The utilities disk includes a program called *HD Mounter*, which is a desk accessory that mounts or unmounts information on files and shows available space. There is also a SCSI manager and a back-up utility. The manual, which is only 12 pages long, is rather minimal and sketchy. But technical phone support, which we had to make use of on several occasions, was responsive and helpful.

The hard disk would boot by itself, but when we inserted our *System* floppy, the hard disk icon disappeared from the screen. When we talked to Relax's technical support, they said that Control Data's disk doesn't support disabling unit attention. Relax plans to install new E-PROMS from Control Data that should solve this problem.

We also had some difficulty duplicating our database. When the test file was duplicated, the drive told us it was only a 50 MB drive and there wasn't enough room to duplicate the file. According to the installer, it's a 292 MB drive. To fix this we had to remove the Relax software system to two floppies and reformat the disk, shut the whole system down, unplug the drive, and reboot with Relax software. We still had trouble reformatting, but it finally reformatted to approximately 291K.

The Relax H300P retails for $4995; however, it carries only a 120-day warranty, significantly shorter than the one-year warranty offered by most drive manufacturers. It finished third fastest in overall speed performance on the Mac II and fourth on the SE.



Relax Technology Internal 172

The Relax 172 is a half-size internal drive for the Mac II. Physical installation is rather confusing because the SCSI ribbon cable is not keyed, and this made it unclear which way to make the connection. Also, the drive tended to be somewhat noisy during the Read/Write operations.

All of the software needed to operate the drive is loaded onto the hard disk, and no software diskette is provided. The software features include an installer, a system folder, a mounter, and a SCSI manager. The back-up utility is *Relax & Save*, a file-by-file utility that lets you store individual files, folders, or the entire drive. The manual is very inexpensive and brief and could definitely use some improvement.

At $3995 the Relax 172 is the least expensive of all the drives tested, internal or external. Its performance on the speed tests was in the fast mid-range. This price/performance rating sounds fairly good, but the Relax drives carry only a 120-day warranty, considerably shorter than the one-year warranty offered by all the other manufacturers.



Rodime 100 Plus

The Rodime 100 Plus is a 3-inch tall Mac footprint-sized drive with a 1-by-3-inch protrusion at the rear where the fan is located. The drive weighs only 8 pounds, making it the second lightest in our study, and the casing material is plastic, unlike all the other external drives tested. The fan on this drive tested the quietest of all on our decibel meter, and it also sounds very quiet to the human ear.

The software provided allows you to select and test SCSI ID, format, and install. The back-up software is *FastBack* by Fifth Generation, which comes supplied with its own excellent manual. One handy feature of this program is that it prints back-up labels for your floppies. It's important to remember that you shouldn't use *FastBack* while in *MultiFinder*. The manual has good, concise installation instructions that include some helpful diagrams. It is organized in an easy-to-use format; however, it does not have an index or a glossary.

The Rodime 100 Plus retails for $2295. It tested slowest of all on the Mac II and fourth slowest on the SE.

Rodime 1000 RX

The Rodime 1000 RX is a half-height 100 MB internal hard disk for the Mac II. Physical installation is very easy, and the only tool required is a Phillips-head screwdriver.

The software provided lets you select and test SCSI ID, format, and install. The backup software is *FastBack* by Fifth Generation, which comes supplied with its own excellent manual. One handy feature of this program is that it prints back-up labels for your floppies. It's important to remember that you shouldn't use *FastBack* while in *MultiFinder*. The manual has good, concise installation instructions that include some helpful diagrams. It is organized in an easy-to-use format; however, it does not have an index or a glossary.

The Rodime 1000 RX retails for $2195. It tested on the slow end of the mid-range in overall speed on the Mac II.

Rodime 1400 RX

The Rodime 1400 RX is a half-height 140 MB internal hard disk for the Mac II. Physical installation is very easy, and the only tool required is a Phillips-head screwdriver.

The software provided lets you select and test SCSI ID, format, and install. The back-up software is *FastBack* by Fifth Generation, which comes supplied with its own excellent manual. One handy feature of this program is that it prints back-up labels for your floppies. It's important to remember that you shouldn't use *FastBack* while in *MultiFinder*. The manual

has good, concise installation instructions that include some helpful diagrams. It is organized in an easy-to-use format; however, it does not have an index or a glossary.

The Rodime 1400 RX retails for $2495. It tested slowest of all the *internal* drives and second slowest of all the drives on the Mac II.

SuperMac Technology DataFrame XP 150

The SuperMac DataFrame XP 150 is housed in an 8-inch tall, 5-inch wide, and 9½-inch deep vertical standing desktop unit in a Macintosh-gray metal case. It has Power and Read/Write lights that show through a seam in the front of the drive. There is no external SCSI ID switcher, so SCSI ID can only be controlled internally using software. SuperMac has developed Run Length Limited (RLL) encoding technology on the DataFrame controller card, which allows it to store 50% more data on its hard disk platter compared to other drives of the same size.



The accompanying software includes a back-up utility that is simple to use and creates a "smart set" directory for back-up. The program initializes, updates, tests, and sets SCSI ID. Point and click operation is Mac-easy.

The utility software includes a data encryption utility called *Sentinal*, which prevents unauthorized use of files. The software also includes *SuperSpool* for the ImageWriter and *Superlaser Spool* for laser printers.

Both spoolers are follow the Mac interface and both include accessory for accessing the print spooler while running any application.

Also included in the software package are the Apple *System* and utilities *Font D/A Mover* and *Disk First Aid*.

The manual is clear and easy to read. It tells you exactly how to set up and use the XP 150. Helpful diagrams show graphically the step-by-step installation instructions. Unfortunately, the SuperMac would not boot up on the Mac II with its Rodime internal hard disk connected. We had to disconnect the Rodime in order to boot the SuperMac.

The DataFrame retails for $3295 with a one-year warranty on the hardware only. Its speed performance was in the mid-range of the drives tested on both the Mac II and the SE, but ease of use, a very good manual, and excellect technical phone support are pluses to be considered.

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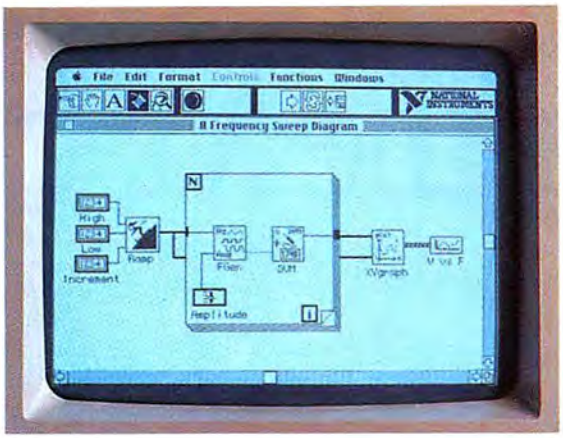


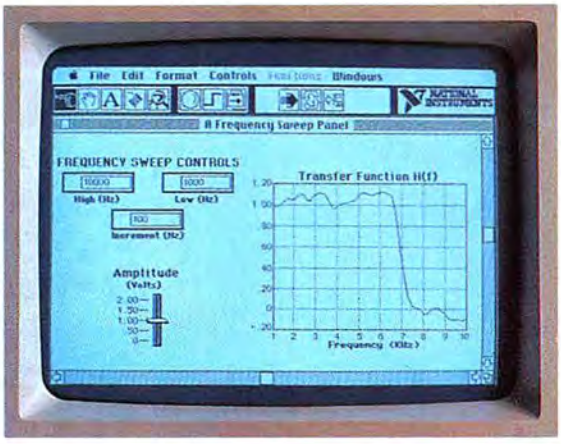
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With CD-ROM and WORM drives, brave new worlds of mega-information await.

After seeing a performance by the great 19th-century actor Edmund Kean, the poet Samuel Taylor Coleridge remarked that "to see Kean was to read Shakespeare by flashes of lightning."

Kean may be gone, but there's a new way to read Shakespeare by flashes of light — optical data storage. Two optical technologies are about to burst onto the Macintosh stage: CD-ROM and WORM drives.

CD-ROM stands for Compact Disc with Read Only Memory. The discs look and work like the audio compact discs that are gradually replacing albums and cassette tapes — except they contain prerecorded text, data, and animation as well as sound, and can be accessed by virtually any Mac application. WORM stands for Write-Once, Read-Many. With a WORM drive, you can store your own data on an optical disc — in effect, replacing a high-

BY JON ZILBER

volume hard disk. You can also use WORMs to reproduce and distribute in-house optical disc databases and applications.

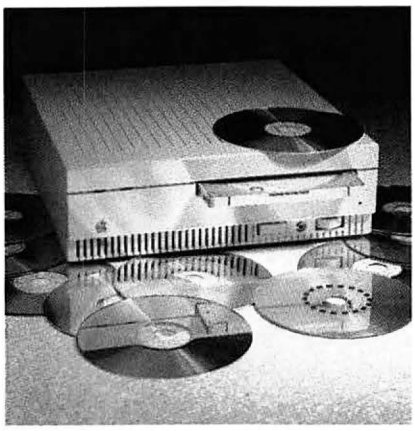
Much of the excitement over optical discs is the sheer volume of data they can hold. A single CD-ROM disc holds over 550 megabytes — roughly equivalent to 700 floppy disks, thirty 20-megabyte hard disks, 2000 high-resolution images, 74 minutes of high-fidelity sound, or 270,000 pages of text, in any combination. A typical WORM cartridge holds 200 or 400 megabytes, depending on whether it's single- or double-sided. (CD-ROM discs are all single-sided.)

With all this information at hand, the ways you can use data changes dramatically. There's plenty of breathing room to freely use the memory-intensive capabilities of the Mac, such as animation and digitized sound. And it's practical to keep libraries of reference works — such as dictionaries, encyclopedias, or the complete works of Shakespeare — as well as archives of your own data — for example, graphics or software libraries, accounting records, and in-house on-line manuals — all within arms' reach. With that much raw information at your disposal, you're going to start thinking about information in a different light.

IT'S THE PITS

Optical discs store information as microscopic pits on the surface of the disc. Laser reflections bouncing off the landscape of pits and flat surfaces translate into binary ones and zeros. These pits can be placed much more closely together than the magnetic markings on a hard disk, resulting in a much denser storage capacity.

There are other benefits of optical media, besides their enormous memory. Because they're non-magnetic, they're not susceptible to damage from stray magnetic interference. (It's surprising how many businesses learn the hard way not to use magnetic copy stands around computer equipment.) Discs are easier to transport or mail than removable magnetic media, and they're less vulnerable to scratches, dust, and spilled coffee. They also have a longer shelf life — at least ten years



— than magnetic media. One drawback of optical media is that disc access time is slower than typical hard disk access times, although accessing an optical disc is faster than accessing floppies.

LIGHT'S EARLY DAWN

Optical discs have been used in the mainframe world for several years, mostly for archiving data. But the concept of a personal CD-ROM or WORM drive has been slow to reach the desktop, for a couple of reasons.

First, they're not cheap — yet. The new Apple CD-ROM drive lists for $1199, with disc titles typically selling for a few hundred dollars. WORM drives are even pricier — the new Optotech MAC Laser Databank, for example, carries a price tag of $3995, with blank discs selling for $65 for a single-sided 200-megabyte disc and $125 for a double-sided 400-megabyte disc. Not bad on a byte-for-byte basis, but not cheap.

Optical media is also not erasable — yet. You can't reuse WORM disks. (Verbatim/Kodak and Hoechst AG are working on erasable — and reusable — optical media.) WORM disks are intended for different jobs than magnetic media; they complement, but won't replace, hard disks and floppies.

And optical discs have not been designed with plug-and-play simplicity — until now. Apple's endorsement of CD-ROM technology represents the first time a major computer company — with a nationwide sales and service network — has embraced this technology.

At press time, Apple expected to ship its CD-ROM player — called the AppleCD SC — in May. Similar drives from a few other suppliers (including ALOT, Toshiba, and Panasonic) are also available or nearing re-

A CD-ROM With A View

Most software products on the market emphasize their functions: what they can do and how easily they can do it. Optical storage opens the door for a new kind of product: data-based software. Data-based software doesn't necessarily have that many nifty features or a snazzy user interface. What it has is volumes upon volumes of information in the form of text, graphics, sound, and animation. With these vast worlds of data at your fingertips, you can do a lot with only a little functionality.

Preliminary versions of several discs offer a hint of how CD-ROM will seek new ways to access information. Apple was distributing promotional copies of *The Apple Learning Disc,* a sampler disc of several educational applications, at the Microsoft International Conference on CD ROM in March. A final version of this disc is expected to ship by fall.

It's too bad Apple isn't planning to bundle this disc (or some other general-interest disc, such as the electronic *Whole Earth Catalog,* a disc of public domain software, or the long-awaited Mac version of Microsoft's *Bookshelf)* with its AppleCD SC drive. But third-party activity is high, and Apple is extending technical assistance and support not only to software developers, but to information providers as well. If you want to turn your own information into an optical disc, you can buy $50,000 worth of software development and pre-mastering hardware and software, farm the job out to a production house, or — if you don't need all the bells and whistles of CD-ROM and only need a few copies — distribute the data on WORM cartridges.

The following disc previews don't really do them justice, since they can't convey sound and motion, or the power of interactivity. But they offer a glimpse of the wealth of information coming soon to a CD-ROM drive near you.

lease. Numerous software and information publishers were also planning to release their first CD-ROM titles for the Mac in May. These discs run the gamut from education, graphics, business, and reference works to consumer and entertainment applications. WORM drives are available or forthcoming from Optotech, ADIC, ALOT, Panasonic, and U.S. Design.

As this article went to press, we had only seen prerelease versions of the products described. So there won't be any mouse-ratings given here, just a sneak peek at the products and technology.

LIGHT READING

The AppleCD SC drive attaches like any SCSI device (that's what the SC stands for), and can be daisy-chained and networked to other Macs, Apple IIs, MS-DOS machines, or any other machine that can connect to an *AppleShare* File Server. Functionally, after you've installed a software cdev and INIT, the drive works like a hard drive that contains locked read-only files. Mechanically, the AppleCD SC drive operates like an audio compact disc player. Instead of a tray for the discs, a "caddy" disc case comes with the drive. The discs themselves are rugged, but scratches and dust still pose a risk (as audio CD owners know), and the caddy reduces this danger. Place the disc in the caddy (shiny-side down) and slide the caddy into the slot, just like a floppy. Indicator lights on the drive tell you that the Mac is acknowledging the drive as a SCSI device or that the drive is accessing data on the disc.

A CD-ROM icon appears on the desktop; it contains files and folders just like a hard disk icon. The files can be applications or data, though many CD-ROM publishers put the applications on a companion floppy disk. This is because some applications create temporary scratch files (to save preferences, for clipboarding, or to update a usage log, for example), so they can't run from a read-only medium. This also lets the publisher update the application software separately from the much larger data files. The data may also be designed for use with an application you already have. For example, the *Kwikee INHOUSE* clip art disc includes art files (in *Illustrator* format) on the CD-ROM disc, and an art cataloging and retriever application on a floppy.

When you're finished with the disk, hit an eject button on the drive, and the caddy pops out. But, as the late-night TV ads say, that's not all!

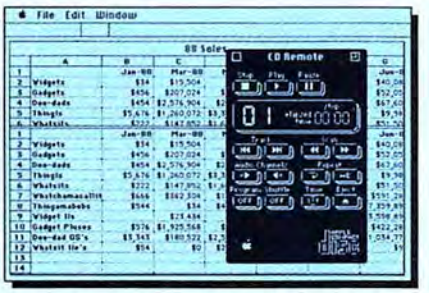
A LITTLE LIGHT MUSIC

The AppleCD SC includes the necessary circuitry and a desk accessory that lets the drive play audio compact discs (through your own headphones or an external amp and speakers). The desk accessory puts an image of a CD remote control on the screen that gives you the play, stop, scan, and programming functions you're probably familiar with from a CD or VCR.

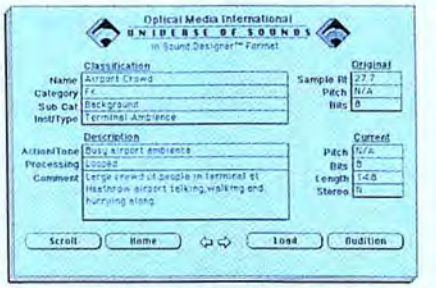
Of course, while you're playing a CD, you can't use the drive for CD-ROM applications. But you can have a little *Supertramp* with your *SuperPaint,* some MacCartney with *MacWrite,* or a Rolling Stones groove along with *Ready, Set, Go!.*

NOW YOU CD-ROM, NOW YOU DON'T

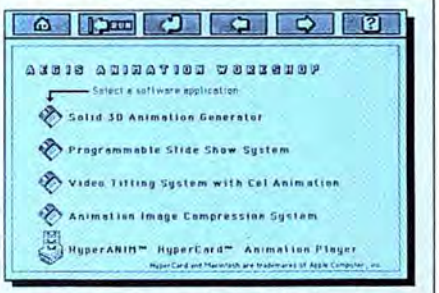
The biggest glitch in CD-ROM's immediate prospects is incompatible standards. Apple's drive was developed for Apple's HFS data format now used for floppies and hard disks. That means that, although discs from the MS-DOS world are physically



You can play back standard audio CDs on the AppleCD SC. Call up the *CD Remote* desk accessory if you need a little musical diversion.



The *Universe of Sounds* disc from Optical Media International contains 1500 musical sounds and sound effects in *Sound Designer* format.



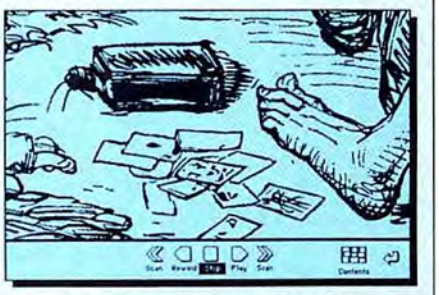
Aegis has developed a *HyperCard* external command (XCMD) for playing back animation at about 15 frames a second.



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compatible with Apple's drive, the data structure is not logically compatible.

This summer, Apple plans to release driver software that supports the so-called High Sierra standard used by most CD-ROM drives and discs. Once Apple's High Sierra drivers are released, you can expect to see a number of discs converted to play on the Apple drives. One of the most eagerly awaited is Microsoft's best-selling *Bookshelf,* a compendium of reference books that includes a dictionary, thesaurus, almanac, style manual, *Bartlett's Familiar Quotations,* and other works on one disc.

MAKING TRACKS

CD-ROM application development typically involves several steps beyond merely collecting data. The first step is to select or create a user interface and a so-called search and retrieval engine for quickly extracting the data (whether it's on-screen text, sound, or graphics) on your disc. The disc format is then premastered (the layout of the data on the disc is optimized to minimize the average access time), finally mastered (converted to the actual binary data format that will be pressed on the master disc), and duplicated. The premastering and mastering steps are often done by service bureaus, as they require expertise and expensive equipment.

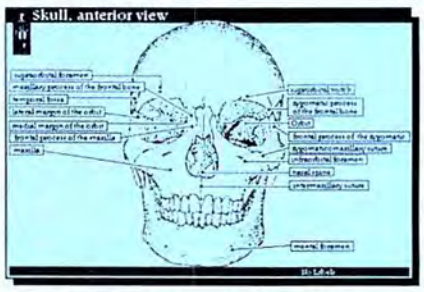
With the Apple drive, *HyperCard* provides a logical and easy interface and search engine that can be created in-house by anyone with even modest programming skills.

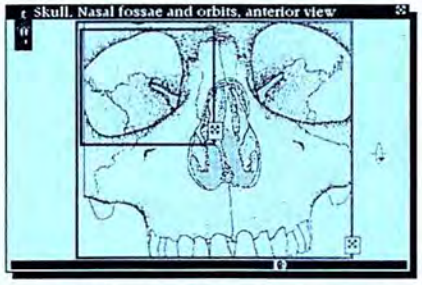
In the MS-DOS world, development of the interface and search and retrieval engine is also often done by third parties. But with the Apple drive, *HyperCard* provides a logical and easy interface and search engine that can be created in-house by anyone with even modest programming skills.

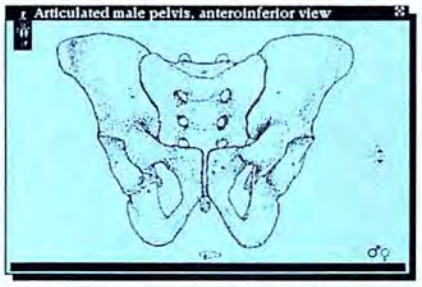
In fact, there was as much interest and conversation about Apple's *HyperCard* at Microsoft's International Conference on CD ROM (where Apple formally announced the AppleCD SC last March) as there was about the drive itself. Apple now has all the pieces in place to turn the fledgling CD-ROM industry from promise to reality: It has an Apple-labeled drive and dealer distribution, and it has *HyperCard,* a tool that seems specifically designed for easy-to-use and easy-to-create CD-ROM interfaces.

This combination is luring CD-ROM developers to Apple, despite the larger installed base of MS-DOS drives. Part of the rationale for why Apple's drive is priced several hundred dollars more than other manufacturers' drives, aside from Apple's traditionally high price margins, may be that the Apple environment includes a trump card for developers in *HyperCard.* Perhaps the CD-ROM market is where Apple will make some money from *HyperCard.*

However, *HyperCard* is not yet perfect for CD-ROM. For starters, a read-only version has to be created; it







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should be released by the time you read this. And *HyperCard*'s built-in searching functions are much too slow for exploring the vast terrain of data on an optical disc.

So third-party *HyperCard* add-ons are appearing. Xiphias, publisher of the *Time Table of Science and Innovation* disc, developed a fast search engine as an external *HyperCard* command (XCMD) that it is licensing to other disc developers. And companies like Aegis and MacroMind are developing animation tools that go far beyond *HyperCard*'s limited graphics abilities.

MASTERS OF THE CD UNIVERSE

Third-party products are also available to expand your CD-ROM network and to master your own discs. For example, CD Publisher from Meridian Data is a CD-ROM mastering system (with prices starting at $32,000). The company also provides mastering services on a contract basis. CD Net, also from Meridian, is a CD-ROM-based file server, although it is not yet compatible with Apple drives.

If you have 34 trillion homeless bytes, SOCS Research is developing a CD-ROM jukebox to store a library of



up to 240 discs. Since you can daisy-chain 256 jukeboxes, the amount of data it can contain is truly staggering.

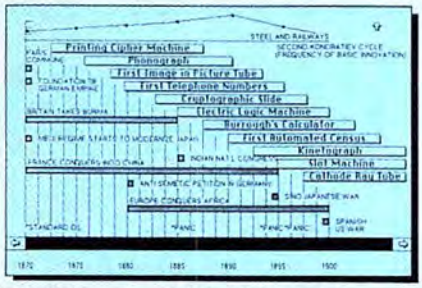
AS THE WORM TURNS

Despite it being a one-time proposition, a Write-Once, Read-Many drive can be a cost-effective solution for many users. If you have libraries of memory-hogging applications — like CAD/CAM drawings, digitized x-rays, sound effects, animation, or text and numeric data — or an unwieldy collection of commercial or in-house software, an optical WORM drive could be an ideal home for your data.

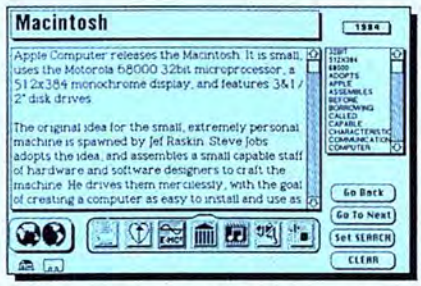
A WORM drive is also ideal if you need to distribute multi-megabytes of information to remote locations but don't want to get involved with all that's involved in pressing a CD-ROM disc. The tried and true "sneaker net" approach may work if your data fits on a floppy disk or two. And file servers are fine if all locations are nearby. But you may need to routinely distribute hundreds of megabytes cross-country, and shipping a hard disk (or hundreds of floppies) is an awkward approach.

Keeping your data on an optical disc instead of a file server also means you can take it with you or store it off-site. Insurance companies like off-site duplicate data storage, so your company's lifeblood — its data — is safe in the event of a fire or other catastrophe, and insurance premiums often reflect this preference. You may also want to keep all your confidential data locked up or off-site for reasons of confidentiality — and that's tough to do with a file server.

Optotech's MAC Laser Databank operates much like a hard disk. (You can't boot your *System* from it, though, so hang on to your floppy or hard drive.) The optical discs are about the same size as CD-ROM discs, kept inside a plastic cartridge. Slip in the cartridge, and an icon appears on the desktop representing the WORM drive. You can save, open, close, and copy folders and documents to and from the drive. Saving and



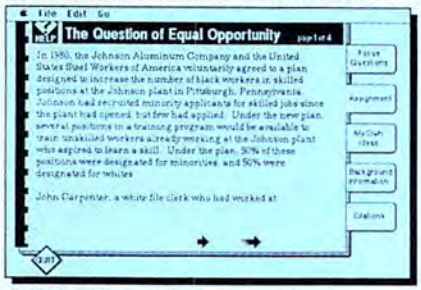
The Xiphias *Time Table of Science and Innovation* traces the sequences and connections among over 6000 stories in the history of man's scientific development. Xiphias developed a fast *HyperCard* search and retrieval command to speed up response time.



Abstracts of research from 3000 medical journals, is available on the *MEDLINE Knowledge Finder* from Aries Systems. You can structure a search by subject, author, data, journal, or language. There's also a "Relevance Filter" for sorting the wheat from the chaff. Slip this disc in your CD-ROM player to learn all about slipped discs.

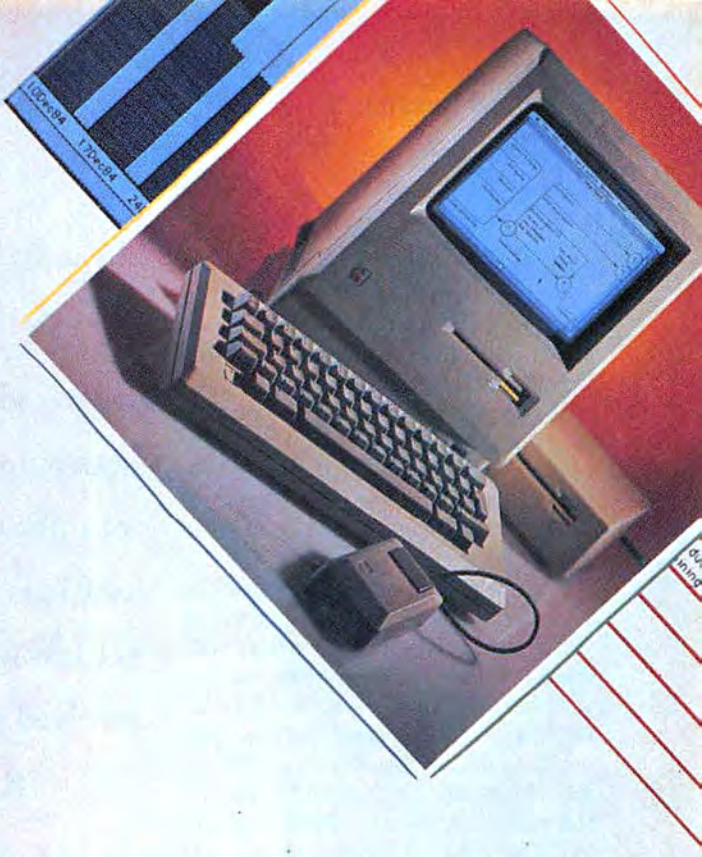


***Project Jefferson* from the University of Southern California combines factual information with tools for gathering and organizing the facts — just the facts, Ma'am — related to project assignments. Data is available in detailed and overview modes.**





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copying documents takes about twice as long on a WORM drive as on a hard disk; since writing to WORM is forever, extra error-checking and correction is performed as the file is written.

When you remove one disc and insert another, it's as if you had unhooked one external hard disk and attached another. You can duplicate WORM files as easily as you can duplicate floppies.

The only things you can't do with your documents are change or delete them — but the Optotech driver software lets you, well, *pretend* that you can. For example, if you want to remove a document from the disc, you can drag its icon into the trash, and the icon disappears, as it would if you did this with a floppy or hard disk. But on a WORM, this doesn't free up any memory; the file is actually still there on the WORM cartridge.

When you drag its icon into the trash, you're simply telling the disc's desktop directory to ignore that file from now on. (Actually, this is what initially happens on a hard disk or floppy, except that the memory locations designated as trash are eventually erased and can be used again.)

Similarly, when you revise a document and save it, a new version of that file is saved, and a new disk directory is created that says to ignore the old version and just use the new files. From your point of view, it's as if you simply edited and saved an existing file; in reality, you create a new document and a new directory file. So every time you make a change — even if that change reduces the size of a file or trashes the file altogether — you use up more of the disc's memory that can never be reclaimed.

> A WORM drive is ideal if you need to distribute multi-megabytes of information to remote locations but don't want to get involved with all that's involved in pressing a CD-ROM disc.

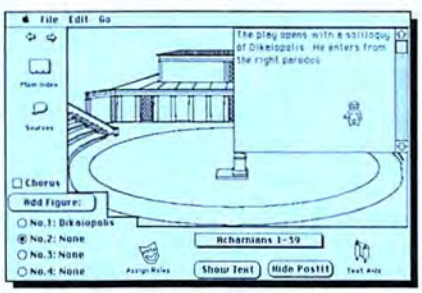
Actually, things are a little more complicated. If you make minor changes to a large file, only a portion of the file is copied and resaved. The new disc directory keeps track of which parts of the file remained the same, where the new parts fit in, and how to patch the pieces together when you open up the document. Of course, all of this is completely transparent to the user; from your point of view, changing a file on a WORM drive works just like on a hard drive.

You also lose a bit more of your memory every time you change the structure of the desktop (if you move a file in or out of a folder, for example), since a new directory must be written. So you can easily run out of available memory, even though you've only got, say, 50 megabytes' worth of documents on a 400-megabyte WORM disk.

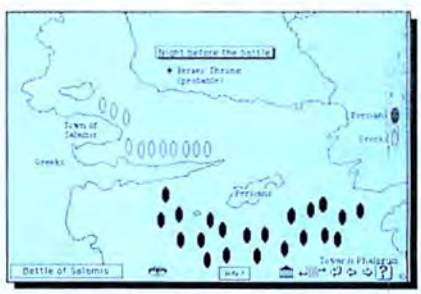
That's one of the main drawbacks of write-only media. If you store software on a WORM disc, you'll discover that some software allocates and uses temporary memory while it runs — except that with WORM, there's no such



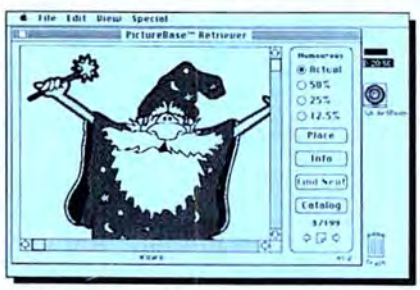
Classical Greek theater comes alive in the *Perseus Project*, created by Harvard University



and Bowdoin College with original Greek texts, profiles of the dramatis personae, and the



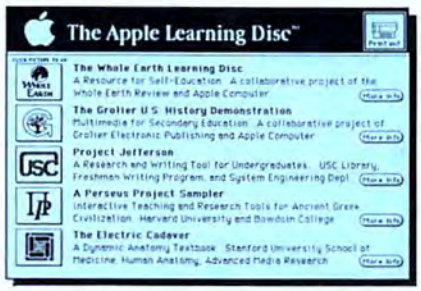
historical backdrop behind the plays. . . . *Entertainment Tonight, B.C.*!



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thing as temporary. How severe you find this problem depends on whether you're using the disk for archived documents or for active documents that you update on a day-to-day basis.

There's a silver lining to this, however: the Optotech driver software has a STATE SAVE command that records and date-stamps the current status of the desktop directory. A STATE SAVE records which versions of what files are currently available, what windows are open and where they are on the screen, and all other information needed to describe the state of the desktop at the moment. Even after you edit files, the old pieces are still there somewhere on the disc. To recreate an old version of a document, all you have to do is *Time Travel* back to an old state.

> Optical disks have a longer shelf life — at least ten years — than magnetic media.

THE WAY WE WERE

Time Travel is an application included with the drive that exploits the fact that previous versions of the file are not actually deleted. It's a simple matter to reconstruct any state from the past.

When you launch *Time Travel*, you're shown a list of all previous STATE SAVES. Click on any state, and your files and windows on the desktop revert to the way they were at the time of that STATE SAVE. Anyone who needs an audit trail can appreciate the value of such a capability.

The Optotech software gives you the option of invoking STATE SAVES whenever you "eject" a cartridge (which includes *System* RESTARTS and SHUTDOWNS, even if you don't physically eject the cartridge). And you can manually order a STATE SAVE at any time.

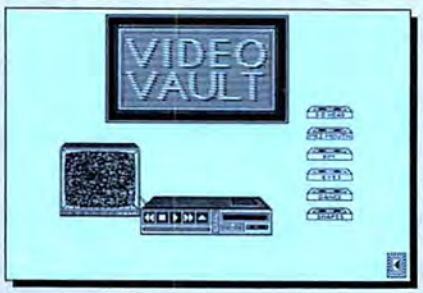
There's one slight difference between the reconstructed historical state you travel back to and the way it really was at the time: There are entries in the *Time Travel* table for any STATE SAVES that took place *after* the date you've traveled back to. (Otherwise you'd have no way to get back to the future, as any sci-fi buff worth his phaser will have already anticipated. If this has you a little confused, don't worry; this kind of discussion always worked for Spock when he needed to disable a computer.)

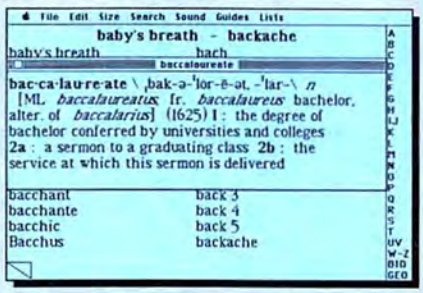
Time Travel has a feature that lets you add a meaningful label (besides the date stamp) to each STATE SAVE. For example, you could call one state "Using Bob's data" and another "After recalc."

DRIBS AND DRABS

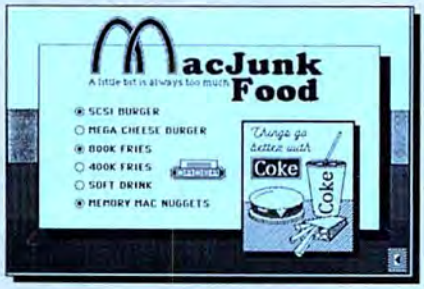
You should count on losing a good chunk of disc space for overhead and for the bookkeeping information needed for *Time Travel*. Each STATE SAVE can use up anywhere from 1 to 20 sectors (a sector is 512 bytes), depending on how complex your files are and how full your disk is. Nine megabytes are used to initialize each new cartridge. About 21K disappears every time you start up your system, and 8K vanishes when you move a folder or file. All this memory nickel-and-diming can easily add up to a megabyte a day, or a full disc's worth of memory over the course of a year.

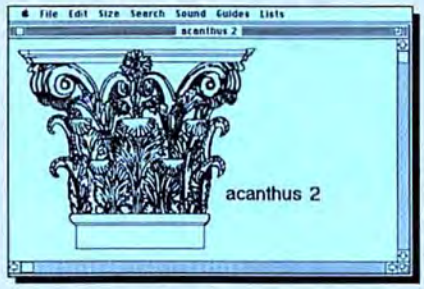
But for the cost of a disc per year,

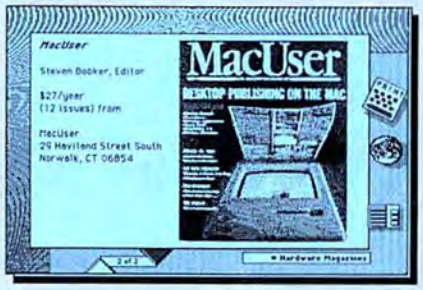












Stunning *VideoWorks II* animation segments are included on a sampler disc from Discovery Systems. Explore a high-tech shopping mall, where you can preview everything from junk food menus and fashions to video rentals.

Highlighted Data's CD-ROM version of Webster's Dictionary includes the full text of all 160,000 definitions, with a spoken pronunciation for all entries, artwork, phonetic typography, and a large print option.

***The Whole Earth Learning Disc* is an on-screen version of the famous catalog. It shows how to access everything from computer magazines to record reviews (including over two hours of sound clips). It's a whole earth after all.**

you're getting the ultimate UNDO command. The $100 or so you'll pay in media costs per year isn't a bad premium for an UNDO insurance policy. (In fact, a variation on *Time Travel* might even be a worthwhile option for erasable media.)

The Optotech WORM drive works with a Mac SE or II; support for the Plus is under consideration. And Optotech's cartridges for VAX, Sun, PC, and Mac drives are interchangeable, as long as your applications on the different machines use compatible file formats.

OPTICAL ALLUSION

Optical information technology will play a big role in changing the future of the Mac. CD-ROM and WORM drives are just the beginning.

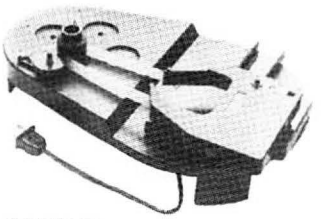
"Infinite riches in a little room" was a phrase penned by Christopher Marlowe in 1589. He wasn't referring to optical data storage, but the information on optical discs is indeed a richness in a little space, infinite in the sense that once created, it costs next to nothing to replicate indefinitely. And, like manure, it often isn't worth much *until* you spread it around.

But usually there's far too much information being spread around; the challenge is sifting through it all to find something of value. A case in point is the amount of work it took to track down the Marlowe quote, paging through reference books at home, in the office, and at the library. And I finally found the Coleridge quote about Kean in an old play program buried in piles of files.

Too much data can be worse than no data. Optical media has the brawn to hold all the data you want in one place, and the Macintosh has the brains to help sift through it. With this combination, finally there's a light at the end of the information tunnel.

FEATURES EDITOR JON ZILBER PROMISED NOT TO POSE THE QUESTION "HAVE YOU EVER SEEN A WORM DRIVE?" OR TO RESPOND "NO, I DIDN'T THINK ANYBODY MADE A CAR WITH A SMALL ENOUGH GAS PEDAL . . . " IN THIS FEATURE.

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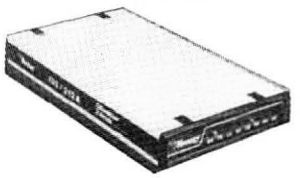
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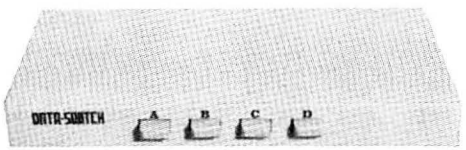
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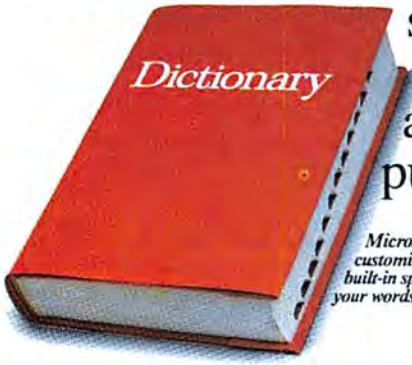
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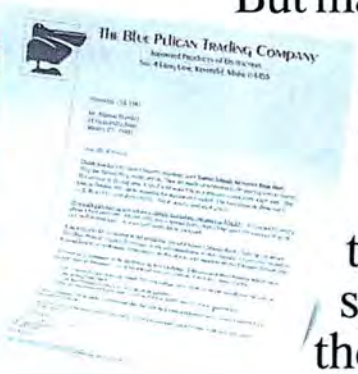
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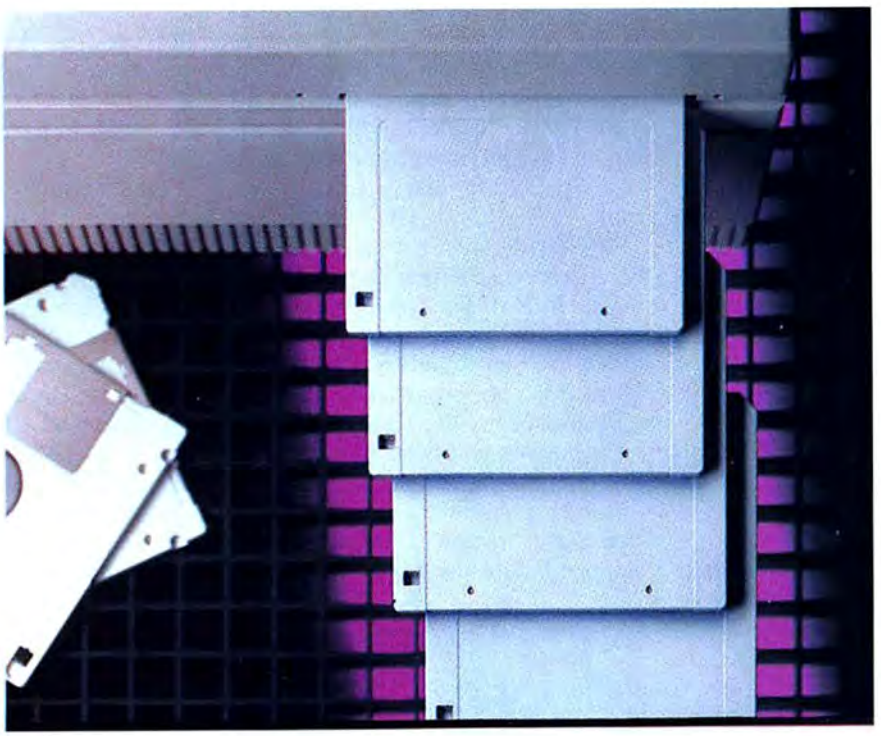
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A middle-level manager saves a thousand dollars by not buying a back-up drive with a new computer system. He earns kudos from his boss until the crash — not the stock market kind, but one involving the hard disk. A computer writer, who should know better, is two-thirds of the way through a book on a popular spreadsheet. His hard drive takes a dive off the desk, dissolving three months of work in a second. All he has left is hard copy (two rewrites old), and he's faced with retyping 200 pages and regenerating some 50 screen dumps.

BY BEN TEMPLIN

When there's so much at stake, it's a wonder why corporations and individuals alike don't back up data. Excuses like "too expensive" or "takes up valuable time" don't cut it when the disk breaks down — there is no "if" about system failure. Backing up is like car insurance. Drive without it, and you could end up paying more than you "saved."

But backing up is more than a safeguard against equipment failure or human error. Used correctly, it becomes a means to transfer information from one hard disk to another or between computer systems. This is especially helpful for distributing large databases or software — like programs running under *A/UX* (Apple's implementation of UNIX) — that exceed 800K. To do it correctly, however, you need the same back-up media and software on both systems, which is not always easy, given the number of options available.

FORMAT WARS

The battle between back-up formats breaks down into two major camps — tape versus disk. Tape records information sequentially; disks access data randomly and are therefore faster. Tapes hold more information; disks don't hold as much data and tend to cost more. Tape is an older technology, but it's had time to work out the bugs. Disk-based systems have more moving parts, so there are greater odds of something breaking. Tapes physically stretch over time, with a possible loss of valuable data; disks are more prone to damage when dropped.

Despite speed considerations, tape is the favored back-up method. It may be slower, but bottom-line thinkers look at the price savings in both the hardware and the media, then opt for this technology. Even within the tape category, there are many alternatives — the two major competitors being cartridges and digital cassettes.

ROLL 'EM

Emerging standards in the Macintosh arena target the DC2000 ¼-inch cartridge tape format as the back-up system of choice — at least Apple has endorsed it and many manufacturers are following suit. A DC2000 tape is about the size of a pack of cigarettes, but can pack in 40 megabytes of data. The recording format, QIC (short for Quarter Inch Cartridge) 100, is the standard around which DC2000 drives store information.

There are a number of other QIC formats, but, for compatibility with Apple, a manufacturer's drive must read and write the same number of tracks and in the same density as QIC 100. Irwin Magnetics, for instance, has a DC2000 drive that only reads and writes in Irwin's proprietary format.

Even with Apple's stamp of approval, not everyone agrees that DC2000 is a good format. The system is slow. Average access time for Apple's unit is about one megabyte a minute. (Some IBM drives back up at the rate of five megabytes a minute.) The speed problems come in part because Apple uses 2:1 interleaving in its DC2000. This means that for every frame of information that is written, a similar frame is skipped before the next frame is laid down. The blank frames are filled in on a later pass through the tape. Tecmar and Mirror use a 1:1 interleaving scheme (in which no frames are skipped) that speeds up the performance of the DC2000 to the tune of about 2.5 megabytes per minute. But cartridges backed up in a 1:1 interleave can't be read by Apple's 2:1 interleave drive. Braemar, a Minnesota company that is an OEM for 1:1 interleave drives, says that users are offered an option to have data written either way.

DC2000 tapes also take a lot of time to format — 30 minutes minimum. You can buy preformatted tapes, but they're more expensive. And some DC2000 users claim that many tapes won't format properly.

Another problem is the 40-megabyte limit. The tape in a DC2000 cartridge is about 200 feet long. Information is stored at 10,000 bpi (bits per inch) on 20 tracks. Some manufacturers are extending the tape's length to 300 feet so that 60 megabytes can be stored, but this requires modifications



Although Irwin Magnetics' DC2000 drive is not compatible with the Apple, the icon-rich software adheres well to the Mac interface.

Even with Apple's stamp of approval, not everyone agrees that DC2000 is a good format. The system is slow. Average access time for Apple's unit is about one megabyte a minute. (Some IBM drives back up at the rate of five megabytes a minute.)

to existing drives. (At press time, drive manufacturers were waiting for tape companies to supply quantities of the 300-foot tape before they released the new hardware.)

Tecmar says the DC2000 has the theoretical potential to store 80,000 bits per inch on 300-foot tape with 40 tracks. This would bring the small cartridge's memory ceiling up to a gigabyte. Such gains, even if feasible, are still several years away. A Tecmar exec, though, says that 150-megabyte tapes could be available by the end of the year. This would mean sacrificing the QIC 100 format for one with more tracks, longer tape, and higher density recording. However, Tecmar maintains that downward compatibility with the QIC 100 format is possible.

The biggest benefit of the DC2000 format is that it's the closest thing to a universal standard for tape back-up in the Macintosh market. With it you can transfer data from hard disk to hard disk even if the second tape drive is made by another manufacturer. Software distribution within and between companies is an enormous auxiliary benefit. For this reason alone, most corporate users will choose to put up with the slow access time and buy DC2000-based systems.

DIGITAL CASSETTES

The biggest competitor to the DC2000 format are ⅛-inch digital cassettes using Teac CT-500 and CT-600 tapes. Since they haven't been endorsed by Apple, the cassette format is relegated to the status of an outsider looking in. But some manufacturers are taking pains to make cassettes the *de facto* standard by trying to outsell and outperform the DC2000. CT-500 and CT-600 store 50 megabytes and 60 megabytes of data respectively on tape the size of audio cassettes. (Teac is working on a 150-megabyte drive that is expected to be released by the end of the summer.) Aside from storing more information, cassettes also have the advantage of reading and writing information up to three times faster than a DC2000 drive (or so the manufacturers of these systems claim). This is incentive enough for people whose main reason for not backing up is that it's time-consuming.

Aside from storing more information, cassettes also have the advantage of reading and writing information up to three times faster than a DC2000 drive.

There is less continuity in recording standards for digital cassettes, primarily because no one like Apple is leading the way. QIC 24, which lays information down on nine tracks, is the record format, but software differences between manufacturers prevent universal compatibility.

There is a "default compatibility" since many of the digital cassette manufacturers bundle their Teac drives with Nuvo Labs' *FastTape* software. Engineers at Nuvo say they are working on a version of *FastTape* that allows you to read the QIC 100 format. If successful, that will open a bridge between digital cassettes and the Apple-dominated DC2000 world.

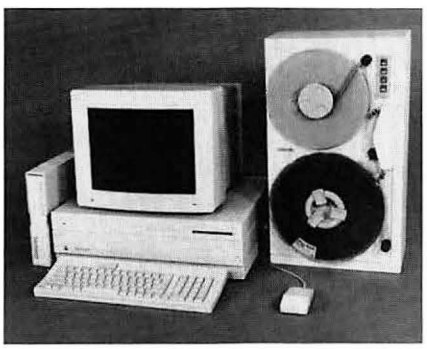
MORE TAPE OPTIONS

Although cartridges and cassette tapes are the frontrunners in the back-up race, there are other choices — some reaching far into the past. Nine-track ½-inch open tape reels are a classic back-up system that comes from the world of mainframe computing. For a long time it was the only medium available for storage. Hollywood loved to use mainframes with these reels spinning as backdrops in early movies that had computers as props. And they're still used in offices today, though the size of the drive has been reduced enough to fit on the desktop. The best thing about open reel tape is that it can transfer information from the Mac to a mainframe and back. This sort of connectivity is even "backwards compatible." With the proper software, you can use the Macintosh to access tapes that were originally mastered on IBM mainframes well before Apple Computer even existed.

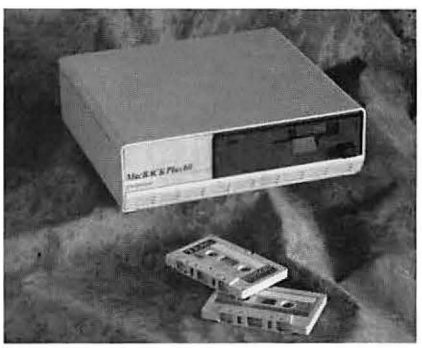
One low-cost alternative for back-up is using a videocassette recorder. Since videotape is a magnetic medium,



Blackhole Technology's MacTape open reel 9-track spools are just as much at home on a mainframe computer as they are with a Mac II.



Qualstar's 1260S Ministreamer has one of the highest memory ceilings; it can store up to 250 megabytes of information on a single reel.



MacBack Plus60 is one of many digital tape players that can store up to 60 megabytes of data on cassettes the size of audio tapes.

it can be used to record computer information as well as the odd TV show. Alpha Micro has taken advantage of this, producing a digital interface that links Macs and VCRs.

DISK RISK

Disk-based back-up systems run the gamut of the price spectrum — if you have money to burn, high-capacity disks are a good medium; if your budget is tight, then you might want to stick with backing up to 800K floppies.

There are a number of options in random access removable media. One alternative is high-density 5¼-inch floppy disks that store 10 megabytes on a single disk. Bernoulli cartridges are 5¼-inch soft media in a hard case and store 20 megabytes. Removable hard disks of up to 40 megabytes are also becoming popular with hard disk manufacturers. The benefit of these media is that you have random access capability in a removable case. So you can easily store a day's work in a safe to prevent harm from theft or fire.

> One low-cost alternative for back-up is using a videocassette recorder.

Some users address the problem of backing up by adding a redundant hard disk — that is, a second hard disk making a copy of everything that's saved to the first. This really isn't a viable solution, since a major cause of hard disks crashes are *System* problems that will probably affect the redundant hard disk, too.

Of course, you can always use 800K floppies and one of the popular software programs to back up your data. But this is a viable alternative only if your daily work consists of a few small files.

WORM AND DAT

WORM (Write Once, Read Many) is an optical medium much like CD-ROM (see "Optical Horizons" in this issue), but WORM lets you lay down data only once before it becomes permanently etched on an optical disk. WORM for the Macintosh is just getting to the market. Don't let WORM's exciting technology hook you into an expensive proposition that may not be right for you.

Another promising medium is DAT — short for digital audio tape. This format, originally developed for audio,

Tape and Disk Back-up Devices

Company	Product	Price	Type of Media	Price of Media	Type of Backup	Dimensions in Inches (Height × Width × Length)	Weight	Capacity
ADIC	Data Library APL-40T	$1,495	DC2000	$27	image, file by file, incremental	3.5×6×11	9 lbs	40 MB
Apple	40SC	$1,499	DC2000	$40	image, file by file	3.01×9.7×10.5	7.3 lbs	40 MB
General Computer Corp.	HyperTape[1]	$1,399	DC2000	NA	image, file by file, incremental	3.9×8.3×13.23	7 lbs	40 MB
GigaCell Systems/NuData	Data File 40	$1,299	DC2000	$50	image, file by file, incremental	2.8×8.3×8.3	9 lbs	40 MB
Irwin Magnetics	40MB Backup[1]	$1,395	DC2000	NA	image, file by file	NA	NA	40 MB
Irwin Magnetics	64MB Backup[1]	$1,595	DC2000	NA	image, file by file	NA	NA	64 MB
Jasmine	DirectTape	$1,195	DC2000	NA	image, file by file	2.5×5.25×12.75	NA	40 MB
LaCie	Cirrus 40T[1]	$799	DC2000	NA	image, file by file	3×6×9	3.6 lbs	40 MB
Mirror Technologies	Tape 40	$1,095	DC2000	$40	image, file by file, incremental	3×6.5×12	NA	40 MB
SuperMac	DataStream	$1,295	DC2000	NA	image, file by file, incremental	3×6.5×11	NA	40 MB
Tecmar	QT-Mac40	$1,395	DC2000	NA	image, file by file	2.5×5.25×12.75	NA	40 MB
CMS	TS-60E	$995	Digital cassette	$30	image, file by file	3.5×10×10.5	6.5 lbs	60 MB
Everex	EMAC 60T	$1,395	Digital cassette	$29	image, file by file, incremental	2.68×7.5×13.75	NA	60 MB
First Class Peripherals	T6	$895	Digital cassette	$15	image, file by file, incremental	3.4×7.5×16	11 lbs	60 MB
MacPeak	ST-60	$995	Digital cassette	$35	image, file by file, incremental	3.5×9.7×11.25	10 lbs	60 MB
Peripheral Land	MacBack Plus 60	$1,295	Digital cassette	$50	image, file by file, incremental	2.75×9.75×9.75	11 lbs	60 MB
Relax	Tape 60 Plus	$1,595	Digital cassette	$40	image, file by file, incremental	2.25×10×12	11 lbs	60 MB
Blackhole Technology	MacTAPE/SCSI[2]	$7,695	9-track open reel	NA	NA	8.75×17×24.5	105 lbs	160 MB
NovaStor Corp.	MacStreamer[2]	$3,995	9-track open reel	NA	NA	8.25×12.25×21.5	31.5 lbs	130 MB
Bering Industries	Totem II	$1,195	Bernoulli	$85	image, file by file, incremental	3.23×9.69×10.47	8 lbs	20 MB
SuperMac	XP60+B	$3,495	Bernoulli	$79	NA	5×8×9.5	NA	20 MB
Jasmine	MegaDrive	$999	10 MB floppy	$40	NA	NA	NA	10 MB
Peripheral Land	Infinity	$1,295	10 MB floppy	$18	NA	2.75×9.75×9.75	12 lbs	10 MB
Relax	Konica	$1,295	10 MB floppy	$20	NA	2.25×10×12	11 lbs	10 MB
Custom Memory Systems	CM-45	$1,795	Removable hard disk	$125	image, file by file	3.75×6.12×15	12 lbs	45 MB
Mass Micro Systems	DATA ◇ PAK	$1,775	Removable hard disk	$125	NA	NA	6.5 lbs	45 MB
Relax	SyQuest	$1,795	Removable hard disk	$150	NA	2.25×10×12	11 lbs	45 MB

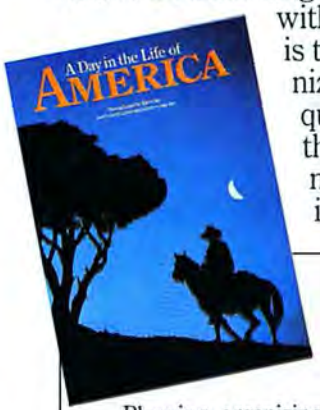
1 Not compatible with Apple's D2000 tape format.
2 Able to transfer data to mainframes.

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has the fidelity of compact discs, plus you can record on it with little, if any, loss in quality from the original. DAT plays a dual role as a high-density medium for computer storage. DAT technology is already sold in Japan, but has been held up in the U.S. by concern over piracy in the music recording industry. Recent government decisions have opened the door to DAT and products may be available before the fourth quarter.

After you've decided on a format, you'll find there isn't a whole lot of difference in the hardware that manufacturers sell.

ON THE SOFT SIDE

After you've decided on a format, you'll find there isn't a whole lot of difference in the hardware that manufacturers sell. DC2000s operating under QIC 100 have similar specs — 40 megabytes of data on 200 feet of tape. But there are performance differences when software is taken into account.

Any good software package performs the three fundamental types of back-up — image, file-by-file, and incremental. An image (or mirror image) back-up means the entire hard disk is duplicated. A file-by-file back-up lets you define what documents should be backed up and what to exclude. Incremental back-ups make copies of files that have been changed since a specified time.

When duplicating whole environments, image back-up is desired because it's faster. One of its primary uses is distributing software to individual hard disks in a corporate environment. In the past, mirror image back-ups wouldn't let you specify individual files to be restored, but this is changing. Check to make sure your software allows this for image back-up.

For day-to-day back-ups, most people require file-by-file — especially when it comes time to restore just one particular document.

Most good back-up systems will give you a choice of all three methods.

Other software features include automatically backing up at a certain time — the end of the work day, for instance. Also check to see if the package allows you to split and then reconstruct a file if you run out of space before the copying process is through.

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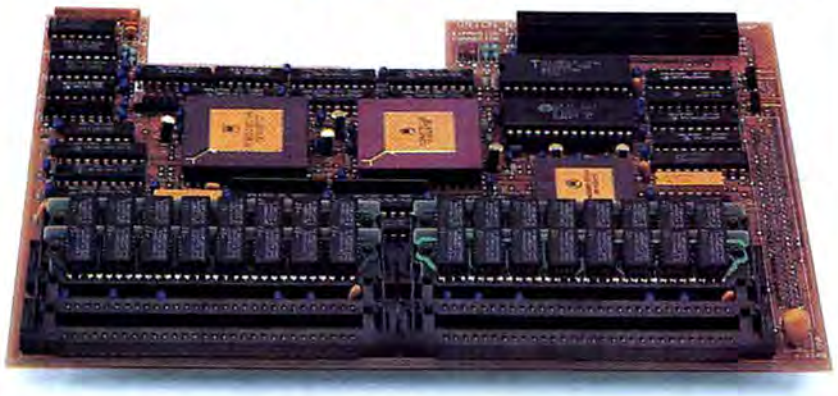
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At very least, the software should tell you that it can't complete a back-up of a file because there isn't enough room.

Some software shows the drive as a mountable volume. In other words, an icon representing the drive pops up on the desktop when a tape or disk is inserted. This allows copying of selected files to and from the drive by simply dragging icons — a very slow method of backing up. MacPeak Systems doesn't allow its unit to be shown as a mountable volume on purpose. This prevents users from using the tape unit as a random access device for day-to-day storage and encourages them to use the tape drive as it was meant to be used.

Error Correction Checking (ECC) is a sequential code that's laid down on a track next to the data being backed up. When data is restored, the code is checked to make sure that the sequence is maintained. If it isn't, you know there's been an error. Most systems have ECC, but some implementations provide a safety valve by trying to rebuild lost bits of information.

Some types of business have very particular needs when it comes to backing up. Accountants, for instance, have to leave an audit trail just in case the IRS decides to take a good look at their books. They need to pull records from tape at a particular point in time — keeping quarterly, yearly, and sometimes even daily figures separate. Be sure to think through your company's information-retrieval needs before committing to a piece of software.

THE FUTURE

What the Mac really lacks in back-up is a system that constantly and transparently backs up data as it is entered. Anything less than a constant transparent back-up means that data will be lost when the system crashes. In the course of writing this article, I lost a revised copy by hitting a RAM ceiling under *MultiFinder*. *MacWrite* 5.0 quit on me when I tried to save the document. I didn't have much to rewrite, but a transparent back-up scheme would have prevented this.

Considering what may be at risk, it's inconceivable that many people don't back up. Still, well-heeled businessmen who wouldn't think of going without health or car insurance will try to save a few thousand dollars by not buying into a back-up system. What they eventually lose in worker hours and irretrievable data makes that couple of thousand seem paltry. Backing up is preventive medicine — time-consuming and costly, but it's more important in the long run than anything else you can do to protect your data. It's a case where a little paranoia is healthy.

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Search and Rescue



Be prepared for disk accidents by getting 1st Aid Kit.

It's probably safe to say there isn't one user reading this who hasn't encountered some type of disk error with the Macintosh. The dreaded "This disk is unreadable: Do you want to initialize it?" sends shivers down the back of even the most hardy computer enthusiasts.

The situation isn't hopeless, however. There are ways to beat the "unreadables." With the introduction of *The 1st Aid Kit*, from 1stAid Software, even casual users can easily and successfully recover a disk from almost any error condition.

MANUAL LABOR

It's possible to ignore the manual and jump right into *1st Aid Kit;* the menus are well done, and the program is intuitive and easy to use. If you do skip the documentation, however, you'll miss the best part of this package — the manual itself. That's hard to take for seasoned users who know only too well the dry taste that most software manuals leave behind. But here is the real exception to the rule.

The folks at 1stAid Software have put a wealth of information into a 300-page, neatly arranged, loose-leaf, tabbed binder. Six chapters and five appendixes cover all sorts of possible errors and how to recover from them. Actually, several programs are now available that can recover files from disk problems, but no one else has put together a package that has such an

BY JOHN GILLETT

MEL LINDSTROM

extensive amount of information in the manual.

If the manual contained only the first chapter — "Things Your Computer Salesperson Never Told You," — it would still be a good book. It's here that you get the basics: what to do when you get an error message, data loss, what causes damage, how to avoid problems, and troubleshooting and recovery procedures.

Disk error isn't the only subject, though. The manual is so full of good, solid information that you can use it as a textbook for learning about the Macintosh Hierarchical File System. There's information on how the Mac works, including ROM, *System,* INIT files, *MultiFinder,* Parameter RAM, and so on; RAM cache; RAMdisks; printing; multiple SCSI devices; *LocalTalk* networks; and much more. A lot of information that Apple doesn't tell you appears here.

LIVING BUGS

To get a feel for the program, you'll want to work through the tutorial. Included on the program disk are six files that have been doctored to show various errors plus three more on which to practice undelete operations. The errors these files generate are real, including one that brings up a *System* bomb. Make sure you are running a *copy* of the program disk when doing the tutorials, as you should always be doing anyway.

The application itself is not copy-protected, and you can move it to a hard drive simply by dragging the icon. One of the doctored tutorial files won't copy in the standard way, however. The easiest thing to do to get a working copy of the disk is to use the COPY DISKETTE function included in the program. This copies the entire disk with all tutorial errors intact.

Rather than give you all the answers, the tutorial forces you to look up error messages and find the fixes in the appropriate sections of the manual. Although this takes more work, it familiarizes you with the manual's structure. The organization is straightforward. Error messages are listed in alphabetical order and refer to specific pages that suggest possible solutions.

Let's say, for example, that you can't duplicate a document using standard *Finder* techniques. You are greeted with the message "That cannot be duplicated or moved." The chapter entitled "Error Messages" lists the message exactly as it appears on the screen. From there, the manual sends you to "Misc-1: Protected Files, p. 154." So far, so good. Misc-1 explains that the Protect Attribute Bit "prevents the Desktop from duplicating, moving, or deleting a file." That certainly sounds like the problem.

A cross-reference directs you to Attribute Bits in the "Recovery Procedures" section of the manual. Maybe the answer is there. Five full pages of information fill you in on the Attribute Bits problem and give a solution. Step-by-step instructions detail exactly how to use *1st Aid Kit* to fix the error.

IGNORANCE IS BLISS

One of the best features of *1st Aid Kit* is that if you want to you can avoid those five pages of information on Attribute Bits and just fix the problem with the program. To do so, launch *1st Aid Kit* as you would any other program. A box at the bottom of the screen shows the disk you're working on. Go to the File Repair menu and select WORK ON FILE. A dialog box displays a catalog of all files on the selected disk. Highlight the file that you can't duplicate and then click on the Copy File button. A dialog box then asks where you would like to place the copied file. *1st Aid Kit* automatically removes the Protect Attribute Bit from the duplicated file, and you can return to the *Finder* and duplicate the fixed file as often as you like. You don't have to know, or even care, about what an Attribute Bit is to solve the problem.

There will be times when you won't know what the problem is, and it's here that *1st Aid Kit* really shines. If a disk or files on a disk can't be read, you just run the DIAGNOSE & RECOVER option under the Disk Repair menu. DIAGNOSE & RECOVER looks at every sector



1st Aid Kit displays information about the current disk in a box at the bottom of the screen. The Disk menu contains management commands such as CHECK FOR UNINITIALIZED DISK, which determine whether a disk is damaged or just needs to be initialized.



The Recommendations window after a disk is run through the DIAGNOSE & RECOVER command. A list of damaged files is included further down in the report.

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on the disk to zero out problem areas. The diagnosis lists detailed information about the disk and gives recommendations on recovering bad information. Usually it's as simple as listing the file and telling *1st Aid Kit* to make new copies on a separate disk.

Sometimes it's not this easy to fix a file — especially if a disk directory is so badly damaged that the volume information can't be read. *1st Aid Kit* has a solution for this, too. The program presents a dialog box that asks for the size and type of disk involved — 400K or 800K; MFS or HFS. By clicking on a button, you select a template that provides generic volume information so that repair operations can proceed. It's also possible to create customized templates for important disks. You do this by selecting ARCHIVE VOLUME INFO under the Disk menu. The process is quick and should provide you with a sense of security just in case something goes wrong with the volume on a critical disk.

If you do have a particularly troublesome file, *1st Aid Kit* allows you to modify some of its identifying information using the WORK ON FILE command under the File Repair menu. This command lets you view the data and resource forks of a document and save that information to a separate file. You can fix the identity of a file, making it invisible, locked, or changing it to a *System* or Bundle file.

Also under the File Repair menu are commands that let you recover a file that has been thrown in the Trash can and rejoin very large files that were split between two 800K disks when copied with the DIAGNOSE & RECOVER command.

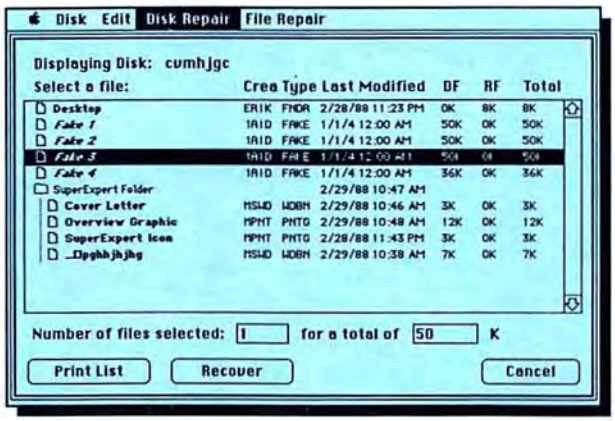
EXTRAS

1st Aid Kit also includes some utilities that make life just a little easier. *PurgeIcons* removes unnecessary information from the Desktop, freeing up disk space. *SysVers* brings up a dialog box that tells you the version of the *System* file. *Cache Flow* is a DA that makes sure any information held in the RAM cache after a save is actually written out to the disk file — not all applications tell the cache to update the disk when a save is done. To use the DA, save as usual, then select *Cache Flow* from the Apple menu. That's all — everything will be saved to disk. If going to the Apple menu is too tough for power-keyboard users, an FKey does the same job.

Technical support for the program is available from the company. The line is in operation only from 3:00-6:00 P.M. Eastern Standard Time, however, and it's not a toll-free call (the company is located in Boston). Toll-free is not as important to me as is the quality of the support furnished. I would, however, like to see a longer time available for calling. Three hours is a pretty short stretch, and it's not always easy to work within that time limitation.

A BETTER BAND-AID

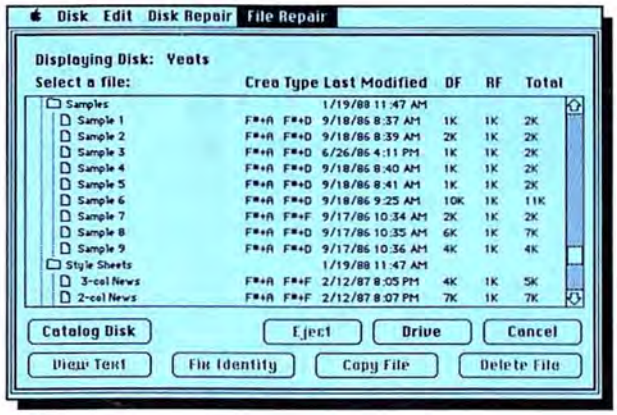
1stAid Software is making available two new versions of the original HFS



The Recover window presents a list of files on a disk. Highlighting a file and clicking the Recover button saves the corrected file to a different disk.



1st Aid Kit allows you to create new folders to maintain your organization when you're recovering damaged files.



The WORK ON FILE command under the File Repair menu displays a catalog of files on a selected disk. From here you can execute basic *Finder* tasks such as getting information and copying and deleting files.

product. The first is simply a bug-fix release, and all known bugs in Version 2.0 are reported to be fixed. There is no charge for Version 2.1.

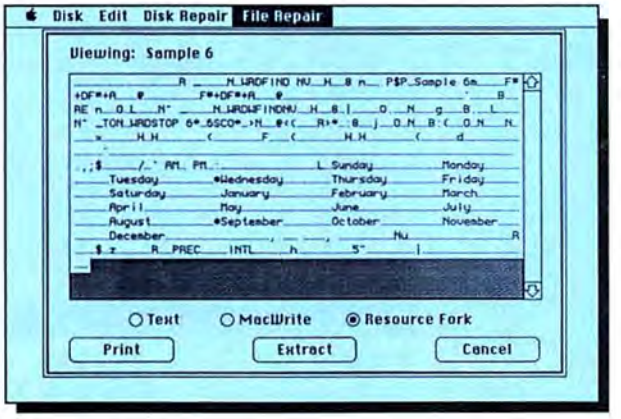
The second upgrade, Version 2.2, is a full revision of the package. In addition to the bug fixes, it contains many new features and enhancements, including faster recovery, improved printing capabilities, and expanded error lists.

You can't actually see most of the improvements in the software itself. These changes are behind the scenes and make the program run in a more efficient manner. The manual, however, has more than 80 replacement or additional pages. In some cases the pages provide new information; in others, sections have been rewritten to present the information more clearly.

The cost of the upgrade to Version



This dialog appears when you choose FIX IDENTITY from the Work On File catalog window. It allows you to lock a file, make it invisible, or modify its identity using four-letter Creator and Type codes.



You can also use the command VIEW TEXT from within the Work On File window. The EXTRACT command saves both the data and the resource forks to a separate file.



1st Aid Kit's on-screen help provides basic descriptions of each command on a menu. You can't access help screens while running a diagnostic check on a disk, however.

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2.2 is $29.95, which is reasonable because it has many new features and extensive revisions have been made to the manual. The attention to detail in the manual simply reinforces what I've already said — this package is the manual. Don't get me wrong; the software is full-featured and good. But the manual is where it's all at!

Also in 1stAid Software's favor was my reason for ordering the program in the first place and its response. A critical disk went bad, and, of course, I had no back-up (sound familiar?). I got in touch with the publisher late one afternoon with a frantic request for a quick shipment. For a few dollars more than the regular price, the program arrived the next morning. Even given the late hour, the company went out of its way to ensure shipment that day.

Version 2.0 (and later) is aimed specifically at HFS disks, both 400K and 800K floppies and hard disks. It performs most repair functions on MFS disks as well. For in-depth repairs of MFS problems, however, you should use Version 1.0 of the software.

To get a good indication of the flexibility of *1st Aid Kit*, I tested it on both floppy and hard disks (HFS only). The hardware I used included a Macintosh Plus, Macintosh SE, and Macintosh II, with memory sizes ranging from 1 to 8 megabytes of RAM. Disk sizes went from 800K to 80 megabytes. It all worked and worked well.

This is a program that anyone can use, both novices and experts alike. It's easy enough to be used without referring to the manual. The 300-page manual is a textbook in itself and should be used as such. Although some recovery operations can be slow, especially on large hard drives, the wait is well worth your while — and infinitely preferable to the alternative.

JOHN GILLETT IS PRESIDENT OF TIGER CONSULTING IN SCOTTSDALE, ARIZONA, AND RUNS RED RYDER HOST BBS (TIGER'S DEN). HE IS MARRIED AND HAS TWO CHILDREN.

MACUSER RATING

1stAid Kit HFS ★★★★½

Follows Mac Interface	■■■■■
Printed Documentation	■■■■■
On-Screen Help	■■■■□
Performance	■■■■◧
Support	■■■■□
Consumer Value	■■■■■

Comments: Diagnoses and recovers "bad" files and disks. **Best Feature:** An excellent manual-turned-textbook that actually teaches you about the Mac's Hierarchical File System. **Worst Feature:** Takes a long time to complete a recovery, especially on hard drives. **List Price:** $99.95. Published by 1stAid Software, Inc., 42 Radnor Road, Boston, MA 02135; (800) THE-FIXR, (617) 783-7118. Requires Mac Plus or later. Version 2.2 reviewed. Mac II and *MultiFinder* friendly. Not copy protected.

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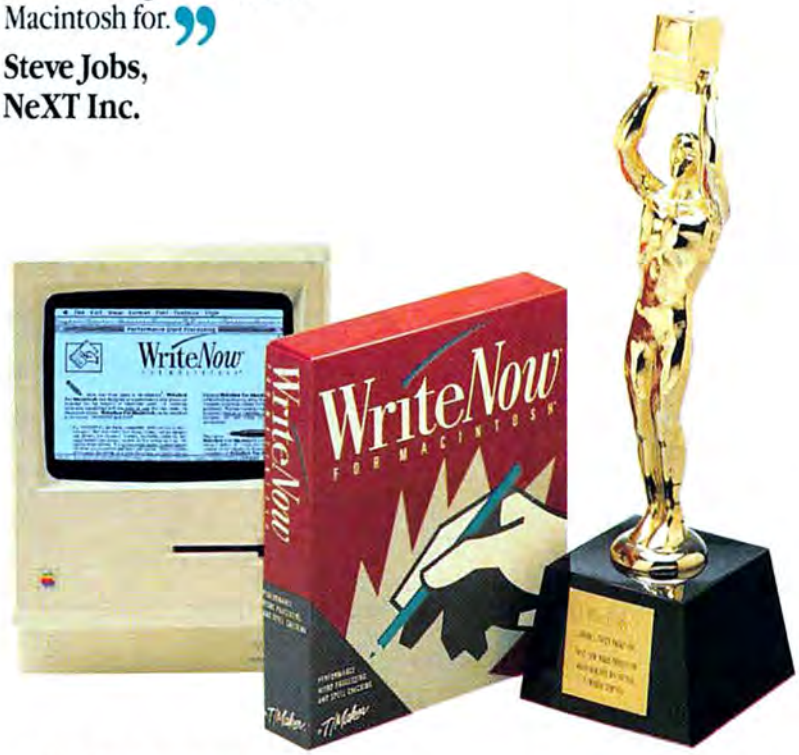
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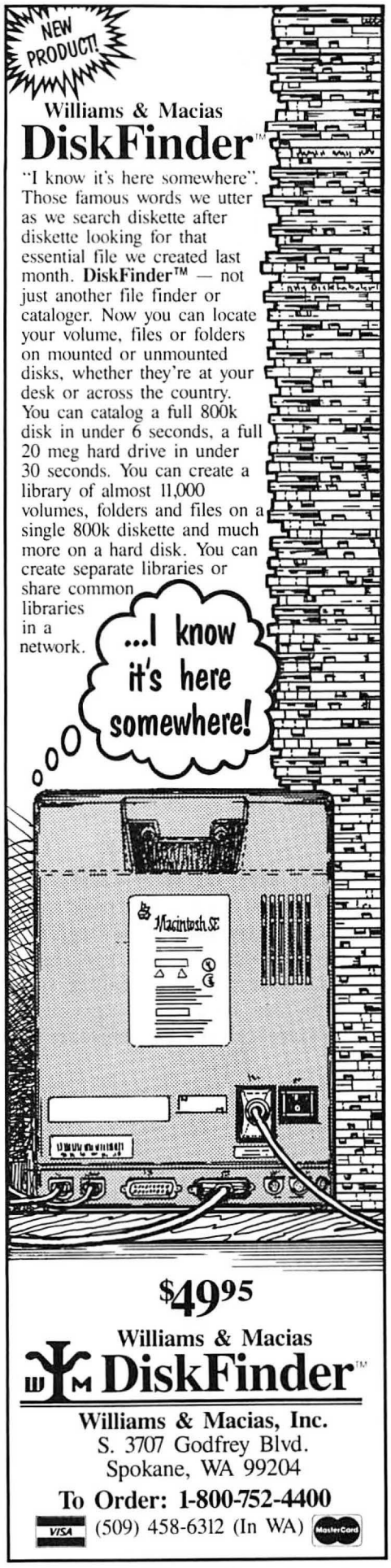
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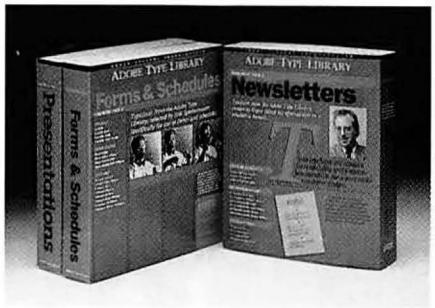
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A STELLA Performance

The latest in simulation software may just tell you where reality begins.

In order is chaos. Break down any complex structure, and you'll find entropy beneath. This popular view has been prompted in part by James Gleick's new book, *Chaos: Making a New Science.* But even as chaos is provoking scientists to redefine theories about evolution and the weather, it's also promoting new tools to help business get a handle on its chaotic influences. *STELLA For Business* is one such tool. It's a compelling program that's bringing a new vision to business systems.

The scientists of *Chaos* would not approve of *STELLA For Business* because it filters out the chaotic influences in a system. *STELLA* (short for Structural Thinking Experimental Learning Laboratory with Animation) is a simulator that allows educators and business analysts alike to create computer models of real-world phenomena — e.g., stock markets or problems in quantum mechanics. [*Editor's note: There are two editions of* STELLA — *one for business; the other for educators.* STELLA For Business *is reviewed here.*] But these models are more than equations floating across the screen. *STELLA* will actually change attitudes taught to business-school graduates. Linear thinking and mental "laundry lists" metamorphose into graphic images that relate to each other. *STELLA* brings the cyclical events of business into an electronic model in which manipulating symbols gives instant feedback on your creative input.

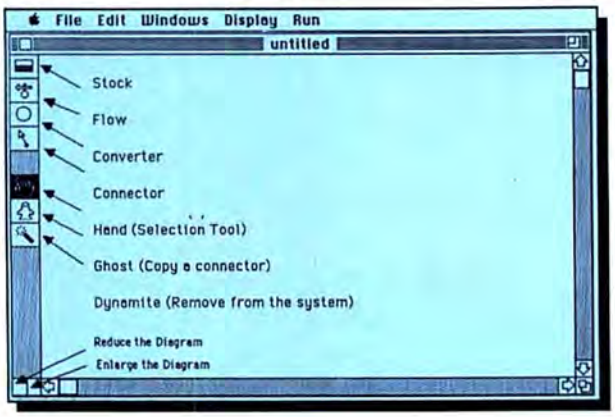
A NEW POINT OF VIEW

STELLA is based on a methodology invented by Jay W. Forrester at the Massachusetts Institute of Technology's Sloan School of Management. This process — known as System Dynamics — is critical to understanding *STELLA.* The manual is one of those rare Macintosh documents that you must read before using the program. One minute into ignoring this warning will inevitably drive you back to the profusely detailed text. The 250-page

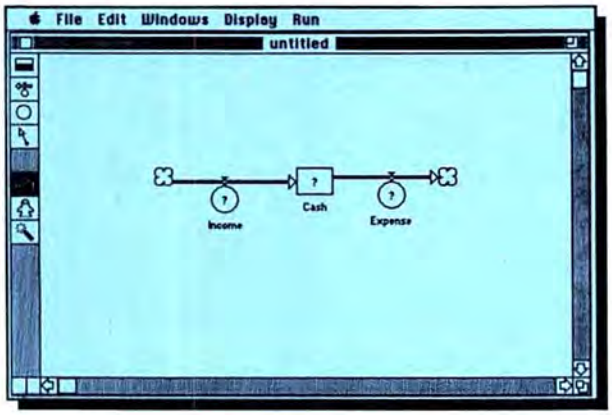
BY DANIEL J. RASMUS

JOOK LEUNG


Relativity Model
Force
Momentum
Mass
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Velocit
Equations
Momentum = Momentum +
Force)
INIT(Momentum) = 0
Acceleration = Force/Mas
Force = 1E9
Mass = Rest_Mass/((1-(V
2/
Speed_of_Light^2))^5)
Mass_Ratio = Mass/Rest_
1 Force
2 Mass
Graph Pad
3 Acceleratior



STELLA Opening: When STELLA opens, it presents a clean, uncluttered appearance. The graphic depictions of the tools all make logical and intuitive sense.



Basic Model: The basic model describes how Income flows into Cash and how Expense flows out.

manual takes about ten hours of intensive study to wade through.

The frustration of "playing" with *STELLA* before reading the manual is not because the software is complex; *STELLA* is a relatively simple program. A mathematically inclined person could probably pick up the basics faster than they could learn to use *Excel*. The problem lies in the System Dynamics framework. *STELLA* simply doesn't make sense if you don't understand the way in which it requires you to think.

A good portion of the manual is devoted to understanding concepts. Here are a few key points. Many traditionalists view the business world as a series of cause/effect relationships. The developers of *STELLA* disagree. They see business as a series of fluid interrelationships in which cause and effect are bound together to form a dynamic system. The developers also believe that you cannot look at the world with an "us vs. them" mentality. Outside forces continue to exert pressure. The important question is not "How do I control outside forces?" but "How do I manage in such a way as to make the organization as resilient as possible to the external forces over which I have little or no control?"

Cultivating models is imperative in management. When the world is looked at as a series of items in a list, eliminating or improving any one item is a common solution to problems. But that mind-set doesn't always yield desired results. With the thinking *STELLA* propagates, business is seen as a web of factors, each influencing the other. By putting this web into *STELLA*, you can modify the system, not just the individual factors.

An example given in the manual is of a *Fortune* 100 firm whose sales have flattened. This firm has a "lifetime employment" policy that makes layoffs a difficult solution to the problem of excess employment. Senior management tries a series of fixes to minimize the problem, but soon breakthroughs in ways of doing business rekindle the strife. When the managers decide to look at the system rather than the symptoms, they discover that no matter what they try, the employment problems continue to occur. With a System Dynamics perspective, the company realizes that swatting a fly won't solve the problem. It needs to monitor workers' skills relative to new needs and retrain some employees. What the company learns is that events don't cause difficulties; events are thorns in the side of an inelastic system that can't respond to a phenomenon. By seeing the broad perspective, events trigger maintenance within the system.

STELLA looks beyond the focus set by our business mentors and management courses. By using *STELLA* to model your business, you may find that the world is not as simple nor as uncontrollable as you think.

THE FRONT END

Although *STELLA* persuades you to relearn how you look at the world, it doesn't require you to rethink the Macintosh interface. This elegant program revolves around four basic types of tools: the stock, the flow, the converter, and the connector.

The stock is an accumulator. When you deposit money into a bank account, the account accumulates the money. Other examples are inventories, smog, bathtub water, or retained earnings. In a *STELLA* model, all these items accumulate in a stock.

The influx of money or any other stock element is controlled through a flow symbol. Flows also control the removal of stock contents. A typical flow might represent your paycheck. The money from the paycheck flows into a stock called Cash. A Rent flow coming out of Cash removes your monthly living expenses. The flow also defines the endpoints of the model. Flows that evaporate into a cloud symbol represent the termination points in a model.

The next symbol in the toolkit is the converter. Converters combine one or more inputs into a single output. As you'll see later, the representation of this conversion can be either graphic or algebraic. Converters are connected to the diagram using connectors.

Other tools on the palette include a hand for selecting objects, a ghost for

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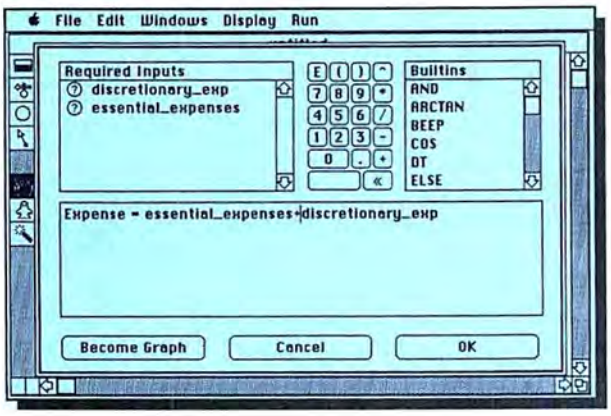
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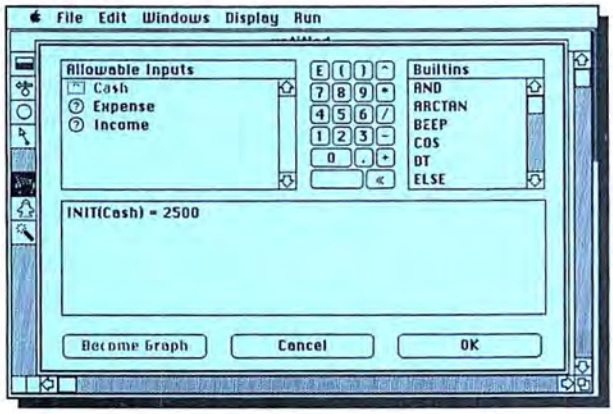
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Creating an Equation: *STELLA* relationships must be stated as mathematical or graphical functions. The arithmetic functions formulate the way two converters are transformed into the single output, called Expense. Equations can be written to implement any common mathematical statement needed to define the system.



Making a Deposit: By replacing the initial-value prompt with a value, the Cash variable is initialized to the starting balance.

duplicating objects, and a dynamite stick for removing objects from the model. The tools are clean and the graphic representations all make sense within the context of the program.

STELLA adheres strictly to the Macintosh interface. Extensions to the standard include the ability to output a document in PICT or Paint format for visual gratification. Most of the menus are context-sensitive. If you have a graph showing on the screen, PRINT GRAPH is the printing command. This is also true for the Edit menu, where definitions of graphs are made. Depending on the active item, the Edit menu reads DEFINE SELECTION, DEFINE GRAPH, or DEFINE TABLE. By making this choice context sensitive, High Performance Systems has created an uncluttered set of menus.

The longest menu is Display, which is where you manipulate a diagram. You can select the numeric format, choose the type of objects that are animated, hide/show pages or icon names, align tables, control the look of scatter plots, move the name to the top or bottom of an icon, reset the journal of model changes, list all the changes made to the model since the last journal reset, and select the sequence in which equations are ordered. The Display menu also contains items for controlling the view of the current diagram. Nothing complex — very little is hidden in *STELLA*.

The Run menu contains the start and stop functions, scaling options, and computation methods.

What does all this mean? Here's a simple model to illustrate *STELLA*'s power.

CASHING IN

One system with which we're all familiar is spending money. Perhaps you haven't thought of it as a system, but the flow of income and expenses is an interrelated compendium of tasks.

Drawing the diagram is simple. You begin by clicking on the stock tool, placing it in the desired location, and clicking. A stock is deposited. While the stock is still active, you type its name — in this case, Cash. You draw flows in much the same way as you do stocks, except that once you have placed the flow, you drag it into or out of the stock. For this model you add two flows: one for income and one for expenses.

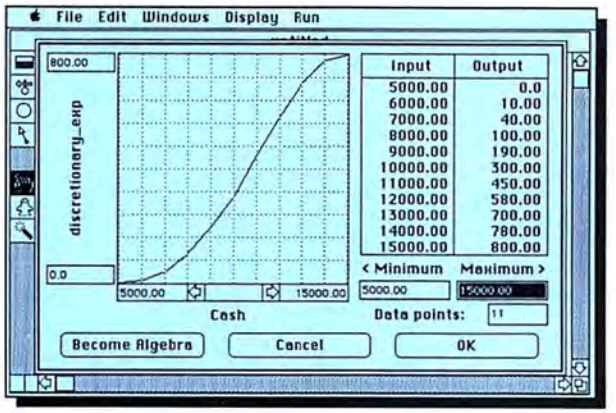
The drawing automatically generates equations for the model that expressly state the relationships between stocks and flows. You can see these equations at any time in the Equations window.

Although you have equations and relationships, the simulation still needs to be set up. And for complex models, this can be one of the most difficult tasks.

This model's equations display Cash as the formula Cash = Cash dt * (Income–Expense). The dt in the equation is called an instant. Instants are user-definable segments of time that *STELLA* uses while processing simulations. The standard for this model is one month. Another component of the Cash equation is the INIT(Cash) = {initial value. . .} statement, which means you need to put a balance into the checkbook. To make the deposit, double-click on the Cash stock and type over the already highlighted {initial value. . .} statement with a number. This number becomes the value of Cash when the simulation begins.

To complete the model, you specify the upper and lower limits of your variables using SCALE in the Run menu. Scaling can be achieved through manual limit setting or by allowing the program to set the limits automatically based on simulation. Selecting RUN from the Run menu fires the simulation.

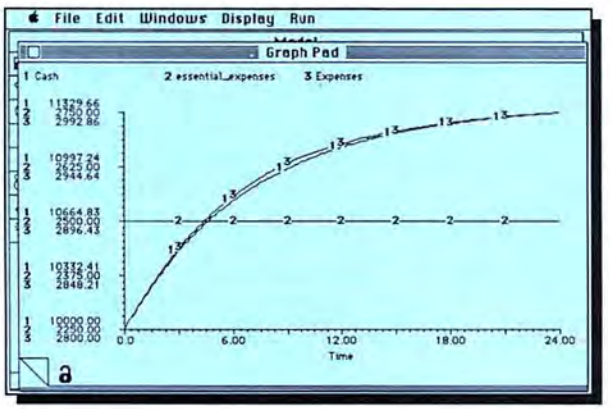
At this point, I'm going to add two other factors to the model that demonstrate the interrelationship aspects of *STELLA*. These factors are essential expenses and discretionary expenses. Because *STELLA* has a limited area available for text entry, I'll abbreviate these names to discretionary_exp and essential_expenses. *STELLA* objects are more like program variables than flowchart symbols. The limited amount of text keeps the diagram and the equations readable. A built-in dictionary that describes objects might prove advantageous for Version 3.0.



The Graphic Relationship: Graphic formulas depict the relationship between an input and an output. In this case, discretionary expenses rise as cash availability increases. Discretionary expenses are set at a limit of $800 and become 0 should the simulated cash fall below $5000.



Balancing the Scales: When a new model is created, the system must be scaled prior to running the model. *STELLA* uses AutoScale to set limits for each variable based on the highest and lowest values achieved during the simulation.



The Results: This graph shows the results of setting up the model properly. The less than frugal model sees a little extra money and starts spending it. Cash continues to rise but not to the extent it would if the graph of cash vs. discretionary expenses were input more conservatively.

PAY AS YOU GO

When we think of systems, we usually picture a series of items that feed each other, or "close the loop." The final stage of this model appears more like a system than does its earlier incarnations. Whenever items are added to a *STELLA* model, the system must be set up again to include the new factors. Expense was initially a simple number that took money from Cash. It has now been converted into a summary of discretionary expenses and essential expenses. In other words, it has been transformed from a constant into a dynamic variable. To define this new relationship, you double-click on Expense. This displays a dialog box showing the allowable inputs to expenses. By clicking on essential_expenses, the plus sign, and discretionary_exp, the Expense flow algebraically becomes the combination of these two elements.

Essential expenses are usually constant, so the initial value for essential_expenses can be established using the same technique as I described for Cash. Because discretionary_exp is influenced by Cash, it has a different relationship in the model — and *STELLA* allows you to define this relationship by drawing a line.

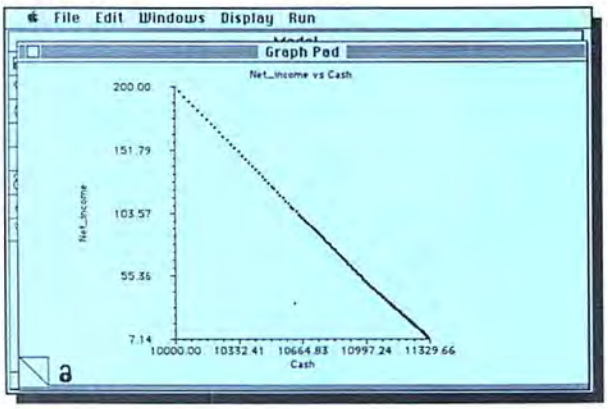
If you double-click on discretionary_exp and then on the Become Graph button in the Formulation window, the screen is transformed into a graphic description of the relationship. *STELLA* already knows that this graph will be described in terms of discretionary expenses based on cash availability. By selecting a minimum and maximum point and finding a normal point, you can then draw a smooth line that describes the partnership.

Once you have defined the variables, the last thing you need to do is create a graph that displays the results you want to track. You do this by bringing a Graph window forward and selecting DEFINE GRAPH from the Edit menu. These graphs can display any set of variables you wish to view. In this case, suppose you choose to view cash, income, and expenses. The chart is automatically defined as a track of these variables over time, and the y axis is given values established during the scaling run.

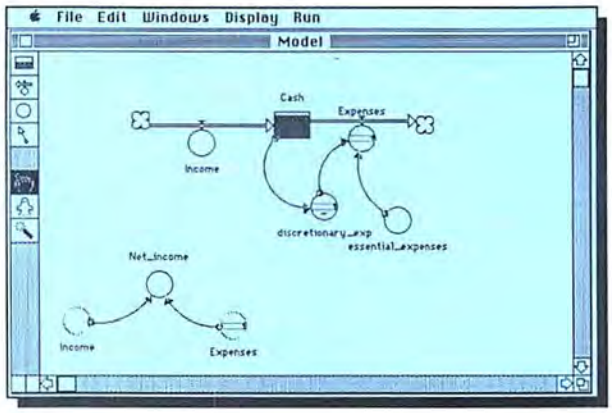
Running this diagram animates the graph and demonstrates that expenses now rise in relation to cash — the more you make, the more you spend (none of us has had that experience, right?)

After watching the simulation, you may want to see how this makes your net income look. You can create a new variable, Net_income, by making ghost images of Income and Expense. These ghosts have the same value as their mortal counterparts but can be used other places in the model where drawing a line might make the diagram look messy. This new relationship can be shown to be Net_income = Income - Expense. By graphing net income as it relates to cash, the system displays a scatter plot that shows the depressing fact that you continue to spend until you spend everything you make.

These are only beginnings. The system described here gives you only a



Net-Income Graph: This graph shows the results of the model in a scatter plot of cash vs. net income. Because the model is not very conservative with funds, it illustrates a negative tendency to reduce savings (cash) as the simulation progresses.



The Final View: Here is the completed model after a simulation run. The filling and special characters give only a flavor of the animation that takes place during a simulation.

flavor of *STELLA*'s capabilities and complexities. The real utilization of *STELLA*'s talents is left to your creativity.

CREATIVE COUNTING

STELLA can model anything that has factors, which means it can model almost anything. The models included on the disk range from manufacturing, sales, marketing, and service to the fall of the Mayan civilization.

STELLA requires customer-driven initiative. The models created in the program are those that are carried around in the mind. They are the thousands of interconnecting factors that we all use to describe the world. The simplicity of the income/expense process can be expanded to show how your income is affected by global economic factors and in turn how your cash, through income and purchases, drives the global economy.

The *STELLA* view is always internal. It is always a perspective limited by the extent to which you want the model to describe the world. One of the cautions in the manual is to check the clouds. When a stock disappears into the nether regions of the cloud, its influence is lost. In the income/expense model, you can see expenses emptying into a cloud. But that cloud is really the bank account of another income supply chain that belongs to the landlord's or retailer's domain.

The bottom line with *STELLA* is thinking. It requires that you think through how you represent your income, your expenses, the factors involved in landing a man on the moon, or the personal system established between a retail clerk and a customer. One of *STELLA*'s most interesting properties is its ability to examine the qualitative perspective. Through the definition of the relationships of people or tasks, the quality of an activity can become explicit.

In most reviews I would take a few lines to sketch out the technical deficiencies of a program or its interface flaws. *STELLA* may not be perfect, but it hasn't irritated me. Even the programs I use most often irritate me from time to time. Maybe I don't use *STELLA* often enough, but it is always a pleasurable experience when the program does what I expect it to do. The only suggestion I have is that the designers think of an easier way to help people understand the concepts of System Dynamics. Perhaps the inclusion of an interactive *HyperCard* stack would make learning the concepts more exciting. The capabilities of the system are considerable if you take the time to learn the concepts necessary to implement them.

STELLA suffers from the classic problem with innovative downsizing of academic mainframe products: Academic mainframe users invent the software they use, so they are excited about the process that makes their dreams flicker to life across the phosphor of a display. Although *STELLA* is creative and powerful, it is difficult to become excited about learning a new way to think. For those willing to learn, there is no better place to make that learning pay off.

REVIEWING THE MODEL

If the learning required to implement a *STELLA* model sounds time-consuming, it is. *STELLA,* for all its delightful Macintosh interface and excellent documentation, is a difficult product to master. Spreadsheets are enhanced representations of accounting pads. Accountants will feel somewhat familiar with at least the look of a spreadsheet when they first see it. *STELLA* has no real-world equivalent. And beyond the foreignness of the program itself, the thinking that is employed for model development is also new. But *STELLA* has its place.

Business analysts who use *STELLA* will find a rich environment for developing business models. Although the model may filter out the chaotic elements of the world, it does an apt job of graphically and logically stating the relationships between system elements. That in itself is a valuable contribution. *STELLA* makes the system visible. With these visibility and simulation techniques, you can test your notions of how your system works. And

that is *STELLA*'s main purpose. Through the use of simulation and graphics, you explore your own concepts of a system. *STELLA* doesn't tell you how many orders will be placed next month, but it does tell you how well your system handles order taking at various activity levels. The complexity of the model can then be tweaked and honed until expectations are dealt with efficiently.

STELLA's complexity may put users off initially. But for those charged with exploring the interlinking maze of systems that make up a modern corporation, educational institution, or historical event, this is the tool. High Performance Systems has made the simulation capability of mainframe computers accessible to a wide audience. Perhaps America's competitive nature can be rekindled through the use of these self-examining paradigms. The confirmation of this possibility is only a simulation away.

DANIEL W. RASMUS IS SENIOR POLICIES AND PROCEDURES ANALYST FOR WESTERN DIGITAL CORPORATION'S MANUFACTURING STAFF. DANIEL IS A FREQUENT CONTRIBUTOR TO MANUFACTURING JOURNALS AND A PRESENTER AT MANUFACTURING SEMINARS.

MACUSER RATING

STELLA For Business

★★★★½

Follows Mac Interface	■ ■ ■ ■ ■
Printed Documentation	■ ■ ■ □ □
On-Screen Help	None
Performance	■ ■ ■ ■ ■
Support	■ ■ ■ ■ ■
Consumer Value	■ ■ ■ ■ ■

Comments: This simulation tool helps make systems more understandable for students, systems designers, and business people. Requires that you master a discipline called System Dynamics. **Best Feature:** Fast operation and an excellent use of the Mac interface. **Worst Feature:** The manual is dry, which makes it difficult to get excited about learning a new way to think. **List Price:** $350; Mac II version, $425. High Performance Systems, 13 Dartmouth College Highway, Lyme, NH 03768; (603) 795-4857. Requires Mac 512K+. Version 2.0 reviewed. Not copy protected.



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REST
Chord Entry
MIDI OUT
MIDI IN

Itty-Bitty MIDI

Despite the color of the box, Apple's first MIDI interface isn't quite a platinum hit.

MIDI is here! Now, thanks to the wizards of Cupertino, your Macintosh can actually play music! This simple, $99 device will transport your favorite computer into a new, exciting world of music and sound — play like Heifetz, become a techno-rock star, write soundtracks for your home videos, and much, much more!"

You probably won't see any ad copy like this for Apple's new MIDI interface, but don't rule out the possibility. Apple has brought out its very first peripheral device — for *any* of its computers — specifically designed for music applications (although the Apple IIGS has a built-in MIDI interface). As evidenced by the parties the company gave to announce it at January's Macworld Expo in San Francisco and at the meeting of the National Association of Music Merchants (NAMM) in Anaheim, it would seem Apple is *very* excited about it.

But there were a few yawns at those parties. For although Apple spokespeople were breathlessly extolling the miracle of their company's entry into the music market, dozens of third-party developers, who have been dragging the Mac, kicking and screaming, into the MIDI world for three years or more, were saying "Big deal." And a few of them were asking, "So where was Apple three years ago, when we really could have used its support?"

The interface itself, however, is only the tip of what may turn out to be a significant iceberg. Apple's internal Advanced Technology Sound Group, established 2½ years ago to investigate and develop ways for Macintoshes to deal with music, sound, and speech, has hit full steam, and we may see some far more interesting musical developments before long. The company is also embarking on a major marketing effort for musical applications, which can only help everyone doing music on the Mac, at all levels.

SIMPLE BUT IT WORKS

But before we get into the implications, let's look at the interface. A MIDI interface is a box that translates digital data coming from a computer — in the case of the Macintosh, from one of its serial ports — into data that conforms to the MIDI (Musical Instrument Digital Interface) specification so it can be read by an external device that also speaks MIDI, such as a digital synthesizer. It also works the other way around, translating MIDI data from a synthesizer's keyboard into serial data that can be processed and stored in the computer. MIDI interfaces can be very simple. And if they are designed to deal with multiple data streams or to use some kind of external timing source, such as audio-

BY PAUL LEHRMAN

tape or videotape, they can be quite complex.

Apple's MIDI interface (which also works with the IIGS) is as simple as they get. It has one MIDI input and one output, located on one side of a small platinum-colored box measuring 2 X 3 X 1¼ inches. On the other side is Apple's standard, circular, eight-pin socket, and the unit comes with a cable for connecting it to the Mac (an adapter cable is necessary for use with an unenhanced 512K or 128K Mac) as well as two MIDI-to-MIDI cables. There are no pilot or data lights, power supplies, or switches of any kind on the box. It just sits there.

Although there is only one MIDI output, the interface can be used with multiple MIDI instruments, thanks to the MIDI Thru jack found on most synthesizers. The MIDI spec says that any data coming into a synthesizer must be echoed out the Thru jack without modification. This allows any number of instruments to be daisy-chained together. Some synths lack Thru jacks, however, and if you find yourself with a couple of those, you'll need a MIDI splitter box (which can cost as much as the interface box itself). Unlike analog audio signals, you can't just use a Y connector to route MIDI data to two different places.

The single input is more of a constraint in that the interface will not let you use more than one MIDI controller. For a musician working alone, this is not a major drawback, but some software lets two or more players jam together, and this interface won't allow that. There are hardware solutions, "MIDI mergers," but these are even more expensive than splitters.

If you keep these limitations in mind, Apple's MIDI interface works fine. Although some interfaces do have trouble with large amounts of MIDI data generated by some programs, this one does not. The MIDI data stream *will* get clogged up if you try to run data simultaneously from multiple controllers (such as pitchbend wheels, pedals, and breath controllers) through it, but it will start to choke at exactly the same point at which other, professionally oriented interfaces do.

A MIDI interface has an internal oscillator, which means it needs electricity. Some interfaces get their juice through an AC power supply, but Apple's doesn't — instead, it draws what little current it needs directly from the Mac's serial port. This has created a minor scandal in some circles because Apple has never allowed third-party developers to do this with their peripheral devices. In fact, back in the days of 512K, Apple specifically warned against this practice, and several interface manufacturers, whose devices depended on a 5-volt line coming from the serial port, were caught with their pants down when the Mac Plus came out and that line was no longer provided.

With a few exceptions, the interface works with all MIDI software on the market, including sequencers, patch librarians and editors, and algorithm-composition software.

Small amounts of current are available at other sources within the port, but Apple's present developers' guidelines don't say anything at all about using that current. The MIDI interface actually draws power from the differential voltage between the two data-out lines. But because this voltage apparently can vary markedly from one Mac to another, this is a practice that Apple pointedly does not encourage anyone else to try.

With a few exceptions, the interface works with all MIDI software on the market, including sequencers, patch librarians, and editors, sample editors, algorithmic-composition software, and effects-list editors. The internal oscillator generates a timing reference, or clock rate, of 1 MHz. MIDI applications are designed to operate using specific timing references, and unfortunately, at the dawn of the Macintosh-MIDI era, three different references were in use: 500 kHz, 1 MHz, and 2 MHz. A program based on one clock rate won't work with an interface that generates a different clock rate.

The majority of applications either have a software "switch" for choosing the clock rate or operate at 1 MHz (which has now become the de facto standard). But there are some earlier programs that run only at 500 kHz or 2 MHz, and owners of such software (most of which is from companies no longer in business) can't use Apple's interface. The interface will also be useless for MIDI applications that require specifically "keyed" interfaces or that need some kind of external timing reference.

One other technical note: The Apple MIDI interface is FCC-approved, unlike most others. Strictly speaking, the FCC must approve the design of any electronic device that contains a radio-frequency oscillator to ensure that it doesn't radiate any stray signals that could interfere with normal TV or radio reception nearby. The approval process, however, is expensive and time-consuming and is widely viewed as a needless formality. I've never heard of anyone missing "Wheel of Fortune" because someone else was playing with *Music Mouse* in the next room.

WHY APPLE DID IT

Inexpensive MIDI interfaces are already available from other manufacturers. They range from simple ones like Apple's (at about the same price or less) to a two-in, six-out, AC-powered box for professional users that lists for only 20 bucks more. So why did Apple bother to introduce a me-too product?

One obvious reason was to respond to the introduction of Atari's ST line of computers, with their built-in MIDI interface. In Europe — and especially in Great Britain, where the price differential between Macs and STs is much greater than in North America — STs have been strong contenders in

the professional music market since they first appeared, and music software developers in this hemisphere as well have begun to take them seriously in the past year or so. More than one Macintosh developer who two years ago swore that he would have nothing to do with Atari computers was showing Atari products at this year's Winter NAMM show.

Apple has figured out that a lot of Macintosh owners — whom it calls "young affluents" — are closet musicians who run *Excel* or *Ready, Set, Go!* all day but who would like to relax at night with a music program they can use with that Casio or Yamaha keyboard they got for Christmas. Although professionals have accepted MIDI on the Mac, the lack of a standard interface that ordinary Apple dealers can recommend to amateurs has slowed its acceptance by that part of the market. There as plenty of good music software designed for those users, such as *Deluxe Music Construction Set* and *Concertware+*. Maybe Apple figures its dealers will be able to support that market better if they can sell an interface from a company they know will still be in business a year from now.

WHAT TOOK SO LONG?

MIDI has been around for nearly five years, and Macintosh MIDI software for three, so why did Apple wait so long to get involved? Actually, it didn't — although its previous efforts in the field were less than effective.

In June 1985 the very first MIDI applications for the Mac were shown at the Summer NAMM convention in New Orleans. A visible presence at that convention was one John (Jack) Sculley, Jr., college-age son of the former Pepsico president. Young Sculley's mission, he told everyone he met, was to establish contacts with developers and distributors so they could benefit from Apple's support. Although he was generously wined and dined by the infant companies, nothing ever came of his efforts. Today few at Apple remember anything about him or his activities, and no one knows why there were no results from his efforts. One source at Apple grumbled that the assignment was nothing more than "something to give the kid to do over summer vacation."

> Apple Fellow Alan Kay noted that the significance Apple attaches to a development is proportional to the size of the shrimp at the press party — and shrimp were huge.

Around the same time, a company called Assimilation Process (known for peripheral devices such as trackballs) announced an inexpensive MIDI interface for the Mac. Claiming to be very close to Apple, Assimilation Process seemed to be developing MIDI Conductor with Apple's blessing. Developers and users who made inquiries at Apple about MIDI were referred to Assimilation, and the smaller company was apparently given favored status with Apple dealers. The device was being designed for Assimilation by Digidesign, a company now known for its high-end sound sampling and production software, and built by Cambridge Automation.

Unfortunately, MIDI Conductor never made it out the door. According to a spokesman for Digidesign, Assimilation ran into technical problems when it wanted the device to be able to switch automatically between MIDI and standard serial duty whenever it sensed that a printer was on-line. By the time it figured out how to do it, the company, reportedly a victim of poor management in many areas, had gone under. Cambridge Automation, a major creditor to the now-bankrupt company, got the rights to sell the 500 or so units made, and some are still floating around. In the meantime, other companies' MIDI interfaces had appeared, and no one wanted to put a lot of effort into propping up what seemed like a very dead product.

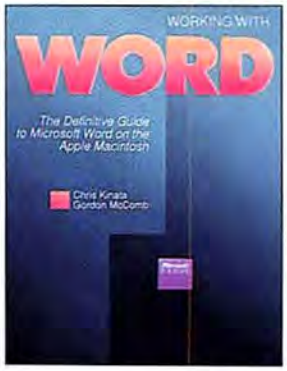
THE HIGH END

These fiascos will not repeat themselves this year. Apple is serious. At the recent NAMM show in Anaheim (which, thanks to someone's massive stupidity, was held the same weekend as the Macworld Expo), Apple for the first time had its own booth, which was populated with exhibits from a dozen third-party developers (all of whom were given an Apple MIDI interface to use) showing an impressive array of products. Clearly, the MIDI interface is just a small indication of the opportunities Apple sees in the music market. The Sound Group, besides working on the *Sound Manager* program for the Mac II and programming leitmotifs for *HyperCard* stacks analyzing Wagner operas, is also enthusiastic about using the Mac for creative audio tasks that were previously handled by dedicated machines costing well into six figures.

The processing power of the Mac, especially the Mac II, and the falling prices of RAM and hard-disk storage mean that the computer can become a "digital audio workstation," in which recordings of *real sound* — not just MIDI data — including music, sound effects, and dialogue, can be stored, edited, manipulated, and played back directly from memory, thereby letting the Mac take on many of the functions of the traditional music and film-sound editing studio. Several third-party suppliers are introducing digital signal-processing cards that go into the Mac II's NuBus slots expressly for this purpose.

To help move things along, around the same time as Expo/NAMM, Apple developed the Audio Interchange File Format (AIFF) in conjunction with several third-party manufacturers. AIFF is designed to let any software that works with recordings of real sounds — for sampling, resynthesis, voice-processing, or video- or film-production applications — exchange data with any other program.

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DO WE NEED IT?

Although no one is seriously against Apple entering the music market, among those who have been working in the field for some time, there is a certain amount of resentment. After the NAMM show, one developer said sarcastically, "I think Apple has shown a real commitment to the MIDI marketplace by producing MIDI cables with its logo on them."

Another, who's been doing music applications since the original Apple II came out, said, "It's easy to get mad at Apple for its arrogance — it thinks it can just move into a market and change history. I've been trying to get Apple to do this for eight years. But I'm delighted it's finally doing so. I think it will double the size of the music market, and I'll be happy to ride on its coattails."

Even developers who make cheap MIDI interfaces are welcoming Apple's participation. "We don't make money on those, anyway," said one manufacturer. "We make it on the professional interfaces and on software."

Another developer believes that Apple actually doesn't want to promote MIDI on the Macintosh (now a *business* machine) at all. Apple "would rather have all the musicians working with the IIGS," according to this developer. "But that's the way Apple has always worked: It looks at a market, makes some pronouncement, and then goes wandering off in the forest."

In any event, Apple has a lot to learn about the music market and what others working with its computers have already accomplished. This was illustrated by the rather crude presentations Apple gave at the interface's introduction, by people who seemed not to know their audience very well. At the San Francisco party, one speaker said, "There's only one input and one output. I've just found out that it's important to tell you that." In Anaheim, one presenter for the company could barely contain her excitement explaining how, through the miracle of MIDI, the folks on stage were about to combine live performance with sequenced music. Her audience, however, mostly giggled, inasmuch as most of them

have been doing precisely that sort of thing for years.

But Apple seems to be willing to give it a good try. In San Francisco, Apple Fellow Alan Kay noted that the significance Apple attaches to a development is proportional to the size of the shrimp at the press party announcing it — and the shrimp were huge. (In Anaheim, on the other hand, where it would have made sense for Apple to make a special effort to please the music dealers, the food ran out after ten minutes.)

The music marketing effort, which began last fall with the appointment of a full-time music marketing manager, now includes heavy advertising in music publications, production of an instructional video for dealers and users, various road shows and "mini-Expos," and signing up Apple dealers around the country to specialize in music applications — while supplying them with top-of-the-line Macintosh music software from several developers and some impressive MIDI hardware.

BETTER LATE THAN NEVER

So Apple is to be applauded, even if in some minds it is getting in a little clumsily and a little late. Although it's easy to get ticked off at, as one developer put it, its claim to have invented the wheel, there's general agreement that Apple's entry can only have a positive effect on the music market, by drawing in new customers who would otherwise be loath to purchase a MIDI interface that didn't bear Apple's seal of approval.

Of course, once customers *do* investigate MIDI, they'll find the other MIDI interfaces that offer far more features at the same price level, so Apple probably should not be too disappointed if sales of its box turn out to be slower than anticipated.

What might help would be the release of some *really* cheap MIDI software to get users going with a minimum of risk. When it was working on MIDI Conductor, Digidesign also designed a no-frills four-track sequencer called *MIDI Composer* (not to be confused with *Professional Composer*), which never saw the light of day. It's still the perfect companion software for an introductory interface, and if no one else brings it out, it's been suggested that Apple license it for a few pennies and, in the tradition of *MacPaint*, give it away with the interface.

And the MIDI interface is only a small part of the picture. Besides coming up with the Audio Interchange File Format, the Advanced Technology Sound Group has made some encouraging statements about how Apple's hardware and operating systems are being developed with at least one eye on MIDI and real-time music applications, and input/output and interrupt structures are being designed accordingly. A logical first step in this direction would be the release of a background utility that would support multiple, simultaneous MIDI applications — a sequencer and an algorithmic-composition program, for example — for musical multitasking. Although Apple itself might not develop such a product, the company might take, according to a spokesman for the group, "at least a passive role" in it.

Judging from their first public appearances, Apple's music staff have their work cut out for them in learning about their market — where it's been and where it could go. But there is a lot of potential. If they are willing to solicit and respond to input from a broad base of users and developers in many areas of musical life, they and the developers they work with may come up with some concepts and products that will make their first little platinum box seem quite insignificant indeed.

Mac MIDI from Mini to Maxi

Apple's is hardly the first MIDI interface available for the Macintosh. The following products are available from third-party developers. All have 1-MHz clock rates, work on any Macintosh, and have their own AC power supply (unless stated otherwise). For each interface, the model name, number of MIDI in and out ports, and price are listed.

ALTECH Systems, 831 Kings Highway, Suite 200, Shreveport, LA 71104; (318) 226-1702. MIDI Interface, one in, three out, powered from the Macintosh, $79.95. Dual MIDI Interface, two in, six out, $119.95.

Austin Development, 227 Marin Street, San Rafael, CA 94901; (415) 454-9620. Midiface II, two in, six out, $120.

Opcode Systems, 1024 Hamilton Court, Menlo Park, CA 94025; (415) 321-8977. Professional Plus, one in, three out, $150. Studio Plus Two, two in, six out, modem/printer Thru switches, $275.

Passport Designs, 625 Miramontes Street, Half Moon Bay, CA 94019; (415) 726-0280. MIDI Interface, one in, one out, powered from the Macintosh, $129.95. MIDI Transport, two in, four out, with SMPTE, "Intelligent" FSK, and MIDI Time Code synchronization, $459.95.

Sonus, 21430 Strathern Street, Suite H, Canoga Park, CA 91304; (818) 702-0992. MacFace, two in, six out, modem/printer Thru switches, $239.95.

Southworth Music Systems, 91 Ann Lee Road, Harvard, MA 01451; (617) 772-9471. JamBox/4+, four in, four out, with SMPTE, MIDI Time Code, and "click" synchronization, $459.

PAUL D. LEHRMAN IS A COMPOSER, SOFTWARE DEVELOPER, AND WRITER IN THE BOSTON AREA WHO HAS BEEN FOOLING AROUND WITH MUSICAL APPLICATIONS ON VARIOUS APPLE COMPUTERS FOR FIVE YEARS. HE IS A CONTRIBUTING EDITOR OF MACUSER AND IS ON THE MUSIC FACULTY OF THE UNIVERSITY OF LOWELL.

MACUSER RATING

Apple MIDI Interface

$$

Follows Mac Interface	N/A
Printed Documentation	■ ■ □ □ □
On-Screen Help	N/A
Performance	■ ■ ■ ■ □
Support	N/A
Consumer Value	■ ■ ■ □ □

Comments: Simple-as-possible MIDI interface with 1-MHz clock rate. **Best Feature:** Because it's made by Apple, dealers will be happy to carry it. **Worst Feature:** Only one MIDI input and one output. **List Price:** $99. Works with all Macs (and IIGS); adapter required for 128K and 512K. Made by Apple Computer, 20525 Mariani Avenue, Cupertino, CA 95014; (408) 996-1010.

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BUM...PA BUM PUM

Can We Talk?

With MacRecorder, applications and HyperCard stacks come alive with the digitized sound of music — or speech. Say good-bye to the sounds of silence.



TOM UPTON

The human interface is based on five primary senses: sight, smell, taste, touch, and hearing. The Mac interface makes extensive use of two of these: touch (for keyboard and mouse input) and sight (for screen and printer output). Its use of sound has been limited to a few beeps, bells, boings, and an occasional customized start-up sound — digitized excerpts from *Silverado* and *The Flintstones* are popular in our office. But sound hasn't really been an integral part of the Mac interface.

That's starting to change. Hypermedia "documents" designed to be "read" on-screen, not in hard copy, can use speech, music, and sound effects as more than just a gimmick. *HyperCard* buttons provide ideal hooks for triggering sounds. And the new MacRecorder from Farallon Computing provides all the tools you need to digitize and attach any sound to any button on any stack.

With sound, you can have inflection, emphasis, and all the nuances of the spoken word. You can add customized sound effects to match visual effects. MacRecorder lets you devise stacks that couldn't be done in silence; stackware that teaches music or pronunciation. And you can also use these same sounds as sound resources in non-*HyperCard* applications.

MacRecorder includes the necessary hardware and two pieces of software. The hardware is a combination microphone/digitizer box slightly larger than a mouse. The software consists of *HyperSound* for recording and placing sounds in *HyperCard* and *SoundEdit* for recording sounds as resources in other applications, editing sounds, adding special effects, and converting sound formats.

All MacRecorder sounds can be played back on the Mac's internal speaker. No special hardware or software is needed for playback, although you can improve the sound by patching the Mac's sound output into an external amplifier and speaker system.

A SAMPLING SAMPLER

Digitizing sound is also called sampling, and the sounds are sometimes called samples. When you sample a sound, you record an instantaneous snippet of sound several thousand times each second. What's recorded is the position of the vibrating microphone membrane as it's struck by sound waves. The number of samples

BY JON ZILBER

recorded each second is called the sampling rate. Playing back the samples at the same rate drives a speaker that mimics the recorded motion of the microphone and recreates the sound waves.

MacRecorder lets you record at any of four sampling rates — 5.5, 7.3 , 11, and 22 kilohertz (kHz) — in either mono or stereo. The sampling rate and the amount of RAM you have determine the maximum length of time a recording can last. A higher sampling rate means a better recording, at the expense of more memory. (See the sidebar "Less Filling, Sounds Great" for details on how the sampling rate affects audio fidelity.)

The MacRecorder hardware plugs into the modem (or printer) port. It draws all its power from the communications signal, so there's no power cord to get in the way. In addition to recording live sounds through the microphone, the box accepts electronic input through a line-in jack or a separate microphone through the microphone jack. (You probably can't improve the sound quality much by using a better mike, but an external microphone might allow better placement or directionality.) A volume-control wheel lets you adjust the input level. You can hold the box in your hand comfortably, but it's better to rest it on a table to avoid any booms and clicks from your fingers tapping on the mike.

The software, especially *HyperSound,* is almost as simple as the hardware. The *HyperSound* stack interface is similar to that of *Studio Session* and some other music programs. A picture of a cassette tape recorder acts much as you would expect it to. Hit the Record button to start recording, adjust the input level with a volume slider, stop recording with the Stop button, and so on. The Forward and Rewind buttons are a little different, though. They are used to shuttle between what would correspond to separate tracks on a multitrack recorder — that is, they don't move backward and forward on one recording but move you back and forth to the different recordings you've made.

Each track is recorded on a separate card in the *HyperSound* stack, with a ceiling of 99 tracks. After that, you can still record more tracks, but they'll get duplicate track numbers. To avoid confusion, you can give each card/track a unique name that can be used with *HyperCard* commands.

You can't access the individual sound "resources" in the usual ways; there's no OPEN command, and resources don't appear on the desktop because they become part of the *HyperSound* stack, which can expand to mammoth proportions. To access tracks you have to use the Forward and Rewind buttons or use a *HyperCard* GO CARD command to find the right sound. Each sound is also given a seemingly random four-digit number used to identify it in *SoundEdit* (where you can convert resources into separate files).

Because it's so difficult to keep your library of sounds in some semblance of order, a good strategy is to move each sound to its ultimate resting stack as soon as you've recorded it. The sequence of steps would be as follows: Select a sampling rate and hit the Record button. A message box comes up telling you to be patient for a moment. Then an information dialog pops up that tells you how much time you have available for recording. This time depends on the sampling rate you select-

Less Filling, Sounds Great

A bureaucrat, speaking about the federal budget, once noted that "A billion here, a billion there . . . pretty soon you're talking about real money." The same applies to the memory needed to store sampled sounds: 44,000 bytes per second here, 44,000 bytes there . . . pretty soon you're talking about some serious memory limitations. MacRecorder gives you two methods for cutting the amount of memory you need: reducing the sampling rate used when you record or using data compression when you save the sample. Both techniques can save a lot of memory without losing much sound quality. Just as video quality is related to the number of dots per inch, audio fidelity becomes "grainy" if the sampling rate is too slow. The sampling rate is typically expressed in kilohertz (kHz), or number of sample points per second. If you sample at a slow rate, what you lose are the high-frequency components of sound. This means that high pitches will be sacrificed and complex sounds (such as speech, musical instruments, and percussive noises) will lose some of their subtleties. (Even low-pitched sounds normally also include high frequency "overtones.") A spectral analysis of a sound — a graphic representation of the many frequencies that combine in a particular recipe to give a voice or a sound its unique characteristics — shows that even sounds that are perceived as having a single pitch consist of many frequencies. It's this mix of overtones that makes two instruments playing the same note sound different.

HIGHER-FI

To retain the richness of a sound, you should sample at a rapid rate so you can capture all the high-frequency activity. This approach poses two problems. First, because all this has to take place in real time, the electronics have to be fast to convert real-world analog sound into computer-compatible digital samples. And second, fast sampling means more bits of data must be buffered in RAM, which translates into higher memory requirements.

Theoretically, audio fidelity can always be improved by moving your samples closer and closer together. But there comes a point at which the human ear can no longer tell the difference. Humans can't perceive audio frequencies higher than 22 kHz (six octaves above F above middle C). So if you record samples 44,000 times each second, you can reconstruct a waveform that won't be identical to the original but the differences will be beyond the realm of human perception.

To reproduce all frequencies up through 22 kHz, you need a sampling rate of 44 kHz (the sampling rate must be twice the highest reproducible frequency). MacRecorder can sample at half this rate, so when it plays the sound back, all frequency components or overtones above 11 kHz (five octaves above F above middle C) are lost. The sound quality won't compare with a CD player, or even with a decent cassette player, and you may not be able to tell a viola from a violin. But you will be able to tell strings from wind instruments, and you

ed and how much RAM is free at the moment and can vary anywhere from a few seconds to a few minutes. You're now "cued up"; when you're ready to record, click on the mouse and roll 'em. When you click or move the mouse again (or run out of time), recording stops. The sound number assigned to this sound resource is highlighted on the "label" of the "cassette," and you can type in a mnemonic name (such as "Barking Cow").

Next, hit the Copy Sound to Stack button and navigate your way to the card where you want to use this sound. Select PASTE BUTTON from the Edit menu, and a new button called Play Barking Cow (or whatever you called the sound) will be placed on the card. Because the Button tool will have been automatically selected, you can now reposition the new button, rename it, and change its appearance using the BUTTON INFO command in the Objects menu.

After attaching sounds to the appropriate buttons, you can still use *SoundEdit* to clean up these resources, add special effects, or rerecord the sounds completely. You won't have to reassign the sounds to the stacks; once the associations between sound resources and *HyperCard* buttons have been established, they stay put.

You can push an information box to check how much memory each track uses, what sampling rate it was recorded at, how long it runs, and when it was recorded.

The *HyperSound* stack has a few other goodies, such as a meter that helps you find an optimal level before you record and an output-level control. There are buttons to quit *HyperCard* and go directly to *SoundEdit* and a button that automatically installs a *HyperSound* button on your Home card. (Every commercial stack should have one of these buttons.) You can select a sampling rate and find out the maximum recording time available using that rate. And you can push an information box to check how much memory each track uses, what sampling rate it was recorded at, how long it runs, and when it was recorded. There are buttons that erase sounds to free up memory and to switch the MacRecorder connection between the modem and printer ports.

And that's about it. It simply couldn't be easier to attach sounds to a stack. On the other hand, you don't really have much control over those sounds. You can't tweak them, files are inconveniently organized, and you can't mix and match sounds stored in different formats. The real power is over in *SoundEdit*.

HIGH-POWERED SOUNDS

SoundEdit lets you record sounds in the same way as *HyperSound* does, but that's just the beginning. Sounds recorded in *SoundEdit* can be stored

can easily distinguish one voice from another. (For comparison, sound transmitted via telephone loses all frequencies above 4 kHz.)

A higher sampling rate means better sound quality, but it also takes up more memory. An even more severe limit is the maximum length of each recording session. The recording takes place in RAM. Each sample takes 1 byte; on a machine with 1 megabyte of free RAM and sampling at 22 kHz, you can store only about 45 seconds. Cutting your sampling rate in half to 11 kHz (or doubling your RAM to 2 megabytes) increases the maximum sound length to 90 seconds. In practice, of course, your *System* and other files will take a sizable chunk of RAM, so the maximum length will be substantially less. On my 1-megabyte SE with *System* 4.1 and far too many fonts, DAs, and resources, I had only 10 seconds of recording time available in *HyperSound* and 28 seconds in *SoundEdit* when sampling at 22 kHz. (And stereo cuts those times in half.)

The number of sounds you can store is limited by your disk storage; a 20-megabyte hard disk can store about 15 minutes of sound sampled at 22 kHz; halving the sampling rate doubles the time length. But there's another way to dramatically increase the storage capacity: compression.

LESS IS MORE

Compression is available only with mono sounds sampled at the maximum 22-kHz rate in *SoundEdit*. Normally, MacRecorder stores 8 bits of data for each sample point, so 256 (2^8) different amplitude values can be assigned to each sample point. When you record in compressed mode, only 1 bit is recorded at each sample point, so less detail about the sound is stored.

The difference in audio quality between compressed and uncompressed sound is similar to the difference in image quality between the display on a 256-gray-scale monitor and a black-and-white display. Compression inevitably loses detail, adds hiss, and gives you a fuzzier rendition of reality. The severity of the degradation depends on the characteristics of the specific sounds. You may find compression unacceptable for music and sound effects. But for speech, you can still easily understand what's being said, who the speaker is, and subtle nuances of inflection and tone of voice.

The payoff is that you increase the maximum recording time by a factor of 8 (and also decrease the amount of memory needed to store a sample by the same factor). With an 8-to-1 compression, 1 megabyte of free RAM can handle 6 minutes' instead of 45 seconds' worth of sound.

If you need to conserve disk space, compression usually gives you a better sounding result than lowering the sampling rate. Sounds sampled at 22 kHz and compressed take up half as much memory as sounds recorded at the lowest sampling rate (5 kHz). One drawback, however, is that *SoundEdit's* special effects are disabled for compressed waveforms.

No zig. No zag.

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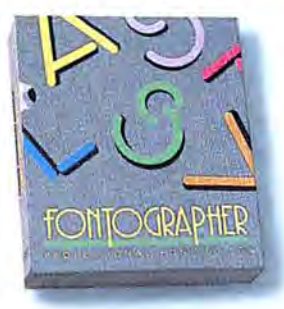
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"You usually answer the phone on the *first or second ring!* You *never* put me on hold for more than 30 seconds! All this PLUS a toll-free number to boot!! And, just about the best price anywhere in the U.S. of A.!!!

"What!!!... Only $3.00 *total* shipping charges for OVERNIGHT SHIPPING??? I order a System Saver Mac on a Tuesday and sign for the damn thing on Wednesday! *LESS* than 24 hours later! You've got to be kidding me!!! There has to be catch!!

"Well yes, there is one catch. Once you've ordered something from MacConnection, you'll never order *anything* from anyone else again. It's that simple.

"I love you people!"

Jeff Woodcock

Jeff Woodcock
Brea, California

MacConnection™

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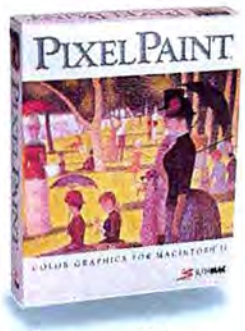
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for a $3 tag.



Kent Marsh ... NCP
The NightWatch—Keep people from traipsing through your hard disk while you're away. Provides startup password protection. An elegant & ingenious solution for security concerns $99.

TaxView Planner 1987-1991 49.
Software Discoveries ... NCP
Merge Write *(MacWrite mail merge)* 35.
Record Holder Plus *(data manager)* 45.
Software Supply ... NCP
Suitcase *(font and DA utility)* 37.
PowerStation *(alternative to Finder)* 37.
Software Ventures ... NCP
Microphone 1.1 *(includes Glue™)* 119.
Microphone II *(MultiFinder compatible)* ... 229.
Solutions, Inc. ... NCP
SmartScrap & The Clipper 35.
SuperGlue *(total graphic integration)* 52.
The Curator *(access your artwork)* 79.
Springboard ... CP
Art a la Mac Volume 1 or 2 *(NCP)* 23.
Early Games *(counting, shapes, ages 2-6)* .. 28.
Easy as ABC *(alphabet, ages 3-6)* 28.
Certificate Maker *(over 200 certificates!)* 34.
Certificate Library Vol. 1 18.
SuperMac Software ... NCP
SuperSpool 3.4 *(very fast, top-rated)* 54.
SuperLaserSpool 82.
Multi-User SuperLaserSpool 199.
Diskfit *(backup & restore utility)* 54.
Network Diskfit *(automatic back up)* 205.
Sentinel *(encryption)* 155.
PixelPaint *(color Paint program)* 259.
Survivor Software ... NCP
MacMoney *(personal finance)* 62.
Symmetry ... NCP
Acta 2.0 *(outline/writing desk accessory)* ... 36.
HyperDA *(access Hypercard stacks)* 42.
PictureBase 1.2 *(clip art manager, 512k)* ... 58.
3G Graphics ... NCP
Images with Impact *(PostScript® clip-art)* .. 65.
Target ... NCP
Scoop *(composition & page layout)* 289.
Think Educational ... CP
MacEdge II *(math & reading)* 28.
Mind Over Mac *(memory & strategy games)* 28.
THINK Technologies ... NCP
HFS Navigator *(search for buried files)* 34.
Laserspeed *(LaserWriter utility)* 55.
Lightspeed Pascal 65.
Lightspeed C *(top-rated C Compiler)* 95.
CAPP's for Lightspeed C or Pascal 49.
InBox Starter Kit *(CP)* 199.
InBox Personal Connection *(Mac or PC)* .. call
T/Maker ... NCP
ClickArt Personal Graphics, Effects, Publications, Letters Vol. 1 or 2, Holidays, Business Images *each* 28.
Christian Images 35.
Bombay, Plymouth, or Seville Laser font ... 45.
EPS Illustrations *(over 3 Meg's worth)* 79.
Write Now *(word processor)* 98.
TML Systems ... NCP
TML Pascal *(compiler, req. 512k)* 59.
TOPS ... CP
TOPS Teleconnector *(DIN8 or DB9)* 45.
TOPS *(file-server/LAN software)* 119.
NET PRINT *(formerly TOPS PRINT)* 119.
TOPS for the PC 119.
TOPS Flashcard *(network add-in card)* 169.
Traveling Software ... NCP
LAP-LINK Mac *(connect Mac to IBM-PC)* .. 85.
True BASIC ... NCP
LANGUAGE & TOOLKIT
True BASIC *(interpreter & compiler)* 119.
3D Graphics Toolkit 49.
Other Toolkits *(Sorting & Searching or Advanced String)* 49.



SuperMac Software ... NCP
PixelPaint—Work with 256 colors at a time from a choice of over 16 million colors. Special effects mode allows for smooth blends & color bursts. Picasso should have had it so good $259.

EDUCATIONAL SOFTWARE
Algebra I or II, Pre-Calculus, Trigonometry, Discrete Math, Probability, Calculus, Arithmetic & MacFunction *each* 35.
TrueSTAT *(statistics)* 58.
Turner Hall ... NCP
MacSQZ *(use w/Microsoft Excel)* 49.
Unicorn ... CP
Animal Kingdom *(ages 6-12)* 27.
Decimal Dungeon *(math, ages 9 and up)* .. 27.
Fraction Action *(arcade style math game)* .. 27.
Mac Robots *(pre-school program)* 27.
Math Wizard *(math games, ages 5-10)* 27.
Read-A-Rama *(reading, ages 5-8)* 32.
William & Macias ... NCP
DiskFinder *(DA disk catalog)* 29.
myDiskLabeler w/Color *(req. ImageWriter II)* 31.
myDiskLabeler w/LaserWriter option 34.
Working Software ... NCP
Lookup *(90,000 word dictionary)* 29.
Findswell *(locate documents fast)* 29.
Spellswell *(spelling checker)* 42.
Spellswell Legal or Medical Dictionary 56.

GAMES

Accolade ... CP
Hardball *(baseball simulation)* $23.
Activision ... CP
Tass Times in Tonetown 21.
Shanghai *(Mah Jongg strategy)* 24.
Portal *(sci-fi novel)* 30.
Addison-Wesley ... CP
Puppy Love *(you and your dog will love it!)* 19.
Ann Arbor ... CP
Grid Wars *(3D arcade)* special 19.
Avalon Hill ... CP
MacPro Football *(req. 1 Meg)* 28.
MacPro Football 1985 Team 16.
MacPro Football Greatest Seasons 16.
Baudville ... CP
Guitar Wizard *(learning tool for guitar)* 22.
Ted Bear's Rainy Day Games 22.
Blue Chip ... CP
Millionaire *(stock market simulation)* 35.
Broderbund Software ... CP
Lode Runner *(over 150 levels)* 24.
Ultima III *(fantasy adventure)* 24.
Ancient Art of War *(military strategy)* 27.
Toy Shop *(create working models)* 30.
Bullseye ... CP
Ferrari Grand Prix *(Formula One racing)* ... 32.
Fokker TriPlane Flight Simulator 32.
Electronic Arts ... CP
Skyfox, Pinball Construction Set, Dr J vs Larry Bird *each* 15.
Ogre *(tank simulation)* 20.
Patton vs Rommel or Scrabble 27.
Chessmaster 2000 28.
Epyx ... CP
Sub Battle Simulator *(NCP)* 24.
Winter Games *(Olympic events)* 24.
Greene, Inc. ... CP
Crystal Quest *(top-rated color arcade)* 24.
Hayden Software ... CP
Sargon III *(9 levels of chess)* 29.
Infinity Software ... CP
Go *(4000-year-old strategy game)* 27.
Grand Slam *(tennis, req. 512k)* 27.
Infocom ... CP
Leather Goddesses, Nord & Bert, Bureaucracy, Hollywood Hyjinx *each* 24.



3G Graphics ... NCP
Images With Impact: Graphics and Symbols 1—Put more impact into your messages and choose from a portfolio of over 60 PostScript® images in a variety of categories $65.

Overnight delivery



Broderbund ... CP
Jam Session—Pre-written songs and animated on-screen band make it easy as 1) choosing a musical style, 2) pressing a key, and 3) receiving your Grammy! $30.

FWB Software ... NCP
Hard Disk Partition 45.
Hard Disk Util *(program backup)* 54.
Great Wave Software ... NCP
TimeMasters *(learn about time, ages 4+)* 22.
KidsTime *(educational, ages 3-8)* 26.
American Discovery *(U.S. facts & fun)* 39.
Crystal Paint *(graphic symmetries)* 42.
ConcertWare+ *(music composition)* 39.
ConcertWare+ MIDI 79.
Greene, Inc. ... NCP
QuickDEX *(address book)* 32.
Hayden Software ... CP
Score Improvement for the SAT 58.
Hayes ... NCP
Smartcom II *(communications)* 88.
Ideaform ... NCP
MacLabeler or DiskQuick 27.
HyperBook Maker *(print stacks into book)* .. 42.
Imagine ... NCP
Smart Alarms *(DA reminder system)* 35.
Multi-user Appointment Diary 89.
Infosphere ... CP
LaserServe *(network software)* 62.
ComServe *(NCP, modem sharer)* 124.
MacServe *(network software)* 159.
Innovative Data Design ... NCP
MacDraft 1.2A *(requires 512k)* 149.
Intuit ... NCP
Quicken *(personal accounting)* 35.
Kent Marsh Ltd.
The NightWatch *(hard disk security)* 99.
MacSafe *(advanced security program)* 99.
LaserWare ... CP
LaserWorks *(graphics editor, LaserWriter)* .. 189.
LaserPaint *(requires Mac Plus)* 314.
LaserPaint Color II *(256 gray scales; NCP)* 379.
Layered ... CP
Notes for...Excel or Microsoft Works 40.
Notes for...PageMaker or Ready,Set,Go!3 .. 40.
Notes for...Microsoft Word 40.
Learning Company ... CP
Reader Rabbit *(ages 7-12)* 39.
Legisoft/Nolo Press ... NCP
WillMaker 2.0 *(prepare your own will)* 29.
Letraset ... NCP
Image Studio *(image processing software)* 279.
Ready,Set,Go! 4.0 *(page layout)* 279.

Linguist's Software ... NCP
Tech *(1000 different symbols)* $59.
LaserTech 79.
FOREIGN LANGUAGE FONTS
SuperFrench/German/Spanish 39.
MacKana/Basic Kanji 39.
MacHebrew or MacKanji 59.
MacHindi Sanskrit *(Amjer)* 59.
MacSemitic/Coptic/Devanagari, MacKorean, MacThai, MacGreek, MacHieroglyphics, MacArmenian, MacGeorgian, MacCyrillic, MacArabic/Farsi, MacAkkadian *each* 59.
MacHebrew Scriptures 79.
MacGreek New or Old Testament 79.
MacChinese *(supplements available)* 79.
MacGreek/Hebrew/Phonetics 89.
FOREIGN LANGUAGE LASER FONTS
LaserFrench/German/Spanish 79.
LaserGreek or LaserHebrew 79.
LaserTransliterator 79.
LaserKorean 89.
LaserCyrillic 115.
Living Videotext ... NCP
More 1.1C *(outlines, windows, & tree charts)* 175.
Lundeen & Associates ... NCP
WorksPlus Spell *(spell checker for Works)* ... 46.
WorksPlus Command *(macros for Works)* .. 61.
MacroMind ... NCP
VideoWorks II *(animation tool)* 118.
MacroPac International ... NCP
101 Macros for Excel 44.
Micro Analyst ... NCP
Mac Zap *(recover crashed hard disks)* 39.
MECA ... NCP
Managing Your Money *(finance)* 129.
Microlytics ... NCP
Word Finder *(synonym finder)* 37.
Microseeds Publishing ... NCP
Redux *(fast & easy backup utility)* 65.
Microsoft ... NCP
Basic Interpreter 3.0 62.
Chart 1.02 *(42 chart styles, CP)* 79.
Microsoft Write 1.0 *(w/spell checker)* 113.
Multiplan 1.1 or File 1.05 119.
Basic Compiler 1.0 125.
Fortran 2.2 *(compiler)* 189.
Works 1.1 *(integrated tool)* 189.
Microsoft Mail *(up to four users)* 195.
Microsoft Mail *(up to 10 users)* 325.
Microsoft Mail *(up to 20 users)* 499.
Excel 1.06 *(power spreadsheet)* 249.
Word 3.02 *(powerful word processor)* 249.
PowerPoint *(presentations)* 249.
Migent ... NCP
In House Accountant *(small business)* 119.
Miles Computing ... NCP
Orchestra of Fonts Vol. 4 special 19.
Mac the Ripper Vol. 3 *(req. Paint program)* .. 27.
Peoples, Places & Things Vol. 5 27.
Mindscape ... NCP
The Perfect Score: SAT *(CP)* 46.
ComicWorks *(create your own comics)* 47.
GraphicWorks 1.1 *(newsletters & posters)* .. 85.
Monogram ... NCP
Forecast *(tax planning)* 40.
Dollars & Sense *(home, small business)* 81.
Business Sense *(full-featured)* 282.
Nantucket ... NCP
McMax *(dBASE III compatible)* 179.
Nashoba Systems ... NCP
FileMaker Plus *(feature-packed database)* 149.

North Edge Software ... NCP
Timeslips III *(time & expense tracking)* ... $119.
Odesta ... NCP
Double Helix II *(relational, custom menus)* 339.
Olduvai Software ... NCP
DA-Switcher *(unlimited desk accessories)* .. 25.
Post ART *(clip art, 3 disk set)* 35.
Icon-It! *(create custom icon bars)* 39.
FontShare *(share PostScript® fonts)* 159.
Read-It!TS *(OCR software for Thunderscan)* 79.
Read-It! *(300 dpi OCR software)* 199.
OWL International ... NCP
Guide 2.0 *(hypertext, free-form info)* 119.
Guide Envelope System 99.
Palantir ... NCP
MacType *(typing instruction, NCP)* 31.
inTalk *(communication to emulation, NCP)* 119.



Chang Labs ... 5 years
C.A.T.—Powerful relational database for managing Contacts, Activities, and Time. Use to organize events, meetings, day-to-day projects, expense reports, personnel records, etc. . $239.

Passport Designs ... CP
Mastertracks Pro *(music editor)* 259.
PBI Software ... NCP
HFS Locater Plus *(DA organizer for HFS)* ... 26.
Personal Computer Peripherals ... NCP
HFS Backup 28.
ProVUE Development ... NCP
OverVUE 2.1 *(power-packed database)* ... 149.
Rubicon Publishing ... CP
Dinner At Eight-Encore Edition Bundle 51.
Satori ... NCP
BulkMailer 3.0 *(mailing lists)* 79.
BulkMailer Plus *(up to 90,000 names)* 195.
Legal Billing *(attorneys to accountants)* 419.
Legal Billing II *(full trust accounting)* 549.
Project Billing *(architects to engineers)* 485.
Sensible Software ... NCP
Sensible Grammar 55.
Silicon Beach Software ... NCP
Silicon Press *(printer utility, 512k)* 41.
World Builder *(program creator)* 41.
SuperPaint *(advanced graphics program)* .. 79.
Simon & Schuster ... NCP
Typing Tutor IV *(typing instruction)* 35.
SoftStyle ... NCP
Epstart *(Epson printer driver, CP)* 27.
Laserstart *(Hewlett-Packard Laserjet, CP)* ... 58.
Printworks for the Mac *(Dot Matrix)* 43.
Printworks for the Mac *(non-PostScript)* 85.
SoftView ... NCP
MacInUse *(time-use manager)* 42.

We'll help take care

Lurking Horror, Plundered Hearts, Borderzone, Stationfall *each* $24.
Beyond Zork 30.
Classic Mystery Library: Moonmist, Suspect, & Witness 36.
Science Fiction Classics: Hitchhiker's, Planetfall, & A Mind Forever Voyaging 36.
Zork Trilogy 42.
Invisiclues Hint Booklets *(please specify)* ... 6.
MacroMind ... NCP
Mazewars+ *(play via modem or network)* .. 31.
Microsoft ... CP
Flight Simulator *(the Mac takes flight)* 32.
Micro Sports ... NCP
MSFL Pro League Football 32.
Miles Computing ... CP
Down Hill Racer *(3D ski simulation)* 24.



Migent ... NCP
In House Accountant–Perfect for small business accounting. Handles receivables & payables with automatic posting; prints balance sheets, reports, bar graphs, pie charts, & checks . **$119.**

Harrier Strike Mission II 27.
Fool's Errand *(optional hint booklet avail.)* 27.
Mindscape ... CP
Trust & Betrayal: The Legacy of Siboot, Crossword Magic, Balance of Power, Deja Vu, Shadowgate, Uninvited *each* 30.
Olduvai Software ... NCP
Maze Survival *(action game)* 21.
PBI Software ... CP
Strategic Conquest *(multi-user)* 35.
Primera Software ... CP
Smash Hit Racquetball II 22.
Psion ... CP
Psion Chess *(3D and multi-lingual)* 31.
Sierra On-Line ... CP
Leisure Suit Larry *(swinging single life)* 23.
King's Quest I, II or III 30.
Space Quest *(save the universe!)* $30.
Silicon Beach Software ... NCP
Airborne! *(CP, digitized sounds)* 20.
Enchanted Scepters *(CP, over 200 scenes)* 21.
Dark Castle *(top-rated arcade action)* 27.
Beyond Dark Castle *(super sequel)* 27.
Apache Strike *(3D helicopter action)* 27.
Simon & Schuster ... CP
Star Trek—The Kobayashi Adventure 24.
Sir-Tech ... CP
Mac Wizardry *(high-rated fantasy)* 35.
SPHERE, Inc. ... NCP
Tellstar II *(No. & So. hemispheres)* 15.
GATO *(submarine simulator)* 26.
Orbiter *(space shuttle simulation)* 26.
Falcon *(F-16 flight simulation)* 26.
XOR ... NCP
Pro Challenge *(football)* 32.
NFL Challenge *(w/illustrated handbook)* ... 64.

HARDWARE

Manufacturer's minimum limited warranty period is listed after each company name. Some products in their line may have longer warranty periods.

1 Meg SIMMs *call for availability.*
AST Research ... 6 months
Mac 286 *(MS-DOS on your Mac II)* call
AST TurboScan *(300 dpi scanner)* call
AST TurboScan *(flatbed scanner)* call
AST TurboLaser P/S call
Curtis Manufacturing ... lifetime
SURGE SUPPRESSORS
Safestrip *(6 outlets)* 21.
Diamond *(6 outlets)* 32.
Emerald *(6 outlets; 6 ft cord)* 36.
Sapphire *(3 outlets; EMI/RFI filtered)* 47.
Ruby *(6 outlets; EMI/RFI filtered; 6 ft cord)* 59.
DataDesk ... 2 years
MAC-101 *(high-performance keyboard)* .. 139.
Dove Computer ... 90 days
Toolkit *(clamp, torx driver & wrist strap)* 15.
SCSI Interface/Port 85.
MacSnap 524E *(512E to 1 Meg)* 156.
MacSnap 524 *(512k to 1 Meg)* 175.
MacSnap 524S *(512E to 1 Meg w/SCSI)* ... 219.
MacSnap 548E *(512E to 2 Meg)* 389.
MacSnap 548 *(512k to 2 Meg)* 399.
MacSnap 548S *(512E to 2 Meg w/SCSI)* .. 449.
MacSnap 2S *(1 Meg to 2.5 Meg)* 489.
MacSnap 4S *(1 Meg to 4 Meg)* 969.
MacSnap 8S *(for Mac II, to 8 Meg)* 1939.
MacSnap Plus 2 *(MacPlus to 2 Meg)* 289.
MacSnap Plus 2H *(MacPlus/SE to 2.5 Meg)* 489.
MacSnap Plus 4H *(Plus/SE/II to 4 Meg)* ... 969.

68020 ACCELERATOR BOARDS FOR MAC SE
Model MSE 1 *(16 MHz, 0 Meg of memory)* $585.
Model MSE 2 *(MSE 1 with 1 Meg)* 779.
Model MSE 3 *(MSE 1 with math co-processor)* 779.
Model MSE 4 *(MSE 1 with 1 Meg & math co-processor)* 975.
1024 Option *(1 Meg accelerator or Mac II memory expansion)* 195.
Math Kit *(math co-processor chip set)* 225.
Ergotron ... 1 year
Mouse Cleaner 360° 15.
MacTilt or MacTilt SE 68.
MacTilt *(for large monitor)* 85.
Farallon Computing ... 1 year
PhoneNET-AppleTalk 120 9.
PhoneNET PLUS *(DB-9 or DIN-8)* 36.
PhoneNET StarController™ 1395.
PhoneNET Punch Down Block Wire Kit ... 69.
PhoneNET CheckNET™ *(multi-user)* 69.
TrafficWatch *(monitor network)* 159.
Hayes ... 2 years
Smartmodem 1200 299.
Smartmodem 2400 449.
MacPlus/SE/II 1200 or 2400 Package call
Kensington ... 1 year
Appletalk Cable Clips or Connectors.. *each* 1.
Mouseway *(mouse pad)* 8.
Mouse Pocket *(for your idle mouse)* 8.
Mouse Pocket *(ADB)* 8.
Mac Plus/Mac SE Cover 9.
ImageWriter II Dust Cover 9.
Printer Stand 16.
Mouse Cleaning Kit w/Mouse Pocket 17.



Microsoft ... NCP
PowerPoint–Compose complete boardroom-quality presentations. Design and arrange 35mm slides, flipcharts, overhead transparencies, etc., all within one program **$249.**

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All items subject to availability. Prices subject to change without notice.
*Defective software replaced immediately. Defective hardware replaced or repaired at our discretion.

of your June bugs.

Disk Drive Cleaning Kit $20.
Tilt/Swivel 20.
Macintosh II Stand 21.
Universal Copy Stand 22.
Extra Long ADB Keyboard Cable 28.
Anti-glare Filter *(for MacPlus or SE)* 33.
Macintosh II Monitor Cable 33.
Surge Suppressor 34.
Apple Security System 34.
Printer Muffler *(80 column)* 37.
Printer Muffler *(132 column)* 50.
Printer Muffler Stand *(80 column)* 25.
Master Piece 400 *(replaces control center)* 64.
A-B Box *(mini DIN-8)* 64.
System Saver Mac 64.
Turbo Mouse *(specify MacPlus, SE or II)* . . . 82.

Koala Technologies ... 90 days
MacVision 2.0 *(digitizer)* 225.

Kraft Systems ... 1 year
3-Button QuickStick 39.

Kurta ... 90 days
IS ADB Tablet *(graphics tablet)* 259.

Migent ... 1 year
Pocket Modem *(ext. 300/1200 baud)* 168.

Mirror Technologies ... 1 year
Magnum 800 External Drive *(platinum)* . . 199.

MSC Technologies ... lifetime
A+ Mouse *(optical mouse)* 69.
A+ Mouse ADB *(for Mac SE & II)* 87.

Nutmeg Systems ... 90 days
Nutmeg 15" Monitor *(for MacPlus or SE)* 1295.
Nutmeg 15" Monitor *(for Mac II)* 1395.
Nutmeg 19" Monitor *(for MacPlus or SE)* 1495.
Nutmeg 19" Monitor *(for Mac II)* 1595.

Nuvotech
TurboNet/AppleTalk connector cable 6.
TurboNet *(DIN8 or DB9 connector)* 28.

Orange Micro ... 1 year
Grappler *(universal parallel interface)* 64.

Passport Designs ... 90 days
Passport MIDI Interface 95.

Personal Computer Peripherals ... 2 years
HD-WSI *(connects Apple HD 20 to SCSI)* . . 295.
MacBottom HD 21 Meg SCSI 749.
MacBottom HD 21 Meg SCSI w/Modem 915.
MacBottom HD 32 Meg SCSI 899.
MacBottom HD 32 Meg SCSI w/Modem 1045.
MacBottom HD 45 Meg SCSI 1159.
MacBottom HD 45 Meg SCSI w/Modem $1295.
MacBottom HD 70 Meg SCSI 1395.
MacBottom IHD-144 Meg *(for Mac II; 1 yr.)* 2195.

Practical Peripherals ... 5 years
1200 Baud External Modem 109.
2400 Baud Communications Pack 249.

SoftStyle ... 90 days
MacEnhancer *(for plotters to printers)* 159.

Summagraphics ... 90 days
MacTablet 12" x 12" 379.

Systems Control ... 2 years
MacGard *(surge protection)* 55.

Thunderware ... 90 days
ThunderScan 4.0 with PowerPort 199.
Mac II Power Accessory 42.



Practical Peripherals ... 5 years
Macintosh Communications Pack—Includes external 2400SA Modem, Microphone II communications software & cable. Hayes compatible, auto-answer. A superior value! $249.

DISKS

Double-sided diskettes.

Sony 3½" DS/DD Disks *(box of 10)* 18.
Fuji 3½" DS/DD Disks *(box of 10)* 19.
Verbatim 3½" DS/DD Disks *(box of 10)* . . . 19.
MAXELL 3½" DS/DD Disks *(box of 10)* . . . 20.



Kurta Corp. ... 90 days
IS ADB Tablet—Finally, a graphics input system that's an ideal solution for the desktop publisher, CAD professional, and artist. Includes software, stylus pen & cordless mouse (with cross hairs) $259.

INFORMATION SERVICES

CompuServe
CompuServe Information Service 24.
Grolier's Online Encyclopedia 32.
CompuServe Navigator 39.

Dow Jones
Dow Jones News/Retrieval Membership Kit 24.

ACCESSORIES

Clean Image Ribbon Co.
Clean Image Ribbon Kit 12.

Computer Coverup
External 800k Drive Cover 4.
ImageWriter II Cover 8.
Mac Plus or Mac SE Cover Set 10.

I/O Design
Imageware II *(ImageWriter II carry case)* . . . 49.
Macinware SE *(Mac SE carry case)* 79.

Kalmar Designs
Teakwood Roll-top Case *(holds 45 disks)* . . 14.
Teakwood Roll-top Case *(holds 90 disks)* . . 20.



Thunderware ... 90 days
ThunderScan and PowerPort—Replaces your ImageWriter's ribbon cartridge to scan and reproduce high quality digitized images (up to 300 dpi). Saves true gray scales and line art $199.

Teakwood Roll-top Case *(holds 135 disks)* 27.

Moustrak
Moustrak Pad *(standard 7" x 9")* 8.
Moustrak Pad *(large 9" x 11")* 9.
Moustrak Pad L/F *(9" x 10¾")* 10.

Ribbons
ImageWriter Ribbons 4.
Available colors: black, blue, brown, green, orange, purple, red, yellow and silver.
Rainbow Pack *(6 single color ribbons)* 20.
Multi 4-Color Ribbon *(req. ImageWriter II)* . . . 9.

Sensible Softworks
Quality "MacAttire" nylon dust covers . . . 7-17.
High Trek ImageWriter II carry case 49.
High Trek Mac SE & ext. kybd. carry case 69.

Targus (Canada) Ltd.
ImageWriter II Carry Case *(black)* 49.
MacPlus Carry Case *(black)* 59.

OUR POLICY

- We accept VISA and MASTERCARD.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order.
- No sales tax.
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail, charged by weight.
- Allow 1 week for personal and company checks to clear.
- COD max. $1000. Cash or certified check.
- 120 day limited warranty on all products.*
- To order, call us anytime Monday thru Friday 9:00 to 9:00 EST, or Saturday 9:00 to 5:30 EST. You can call our business offices at 603/446-7711 Monday through Friday 9:00 to 5:30 EST.

SHIPPING

Continental US: Barring massive computer failures and other natural or unnatural catastrophes, all non-C.O.D. orders phoned into MacConnection by 8 PM EST will ship Airborne the same night for next day delivery, except for those within UPS Ground Zone 1 (which is also an overnight service). The total freight charge on any order placed with MacConnection is now $3. Backorders will also ship Airborne overnight at no additional charge. Some areas require an additional day delivery. **Hawaii, Alaska and Outside Continental US:** Call 603/446-7711 for information.

as separate files that you can also convert into resources or into an Instrument file format that lets the sound be used by music programs such as *Studio Session* or *Jam Session*. *SoundEdit* can mix multiple sounds (into mono or stereo output). Because *SoundEdit* is an application, not a stack like *HyperSound* is, you won't have *HyperCard* hogging most of your RAM, so you can record longer sounds.

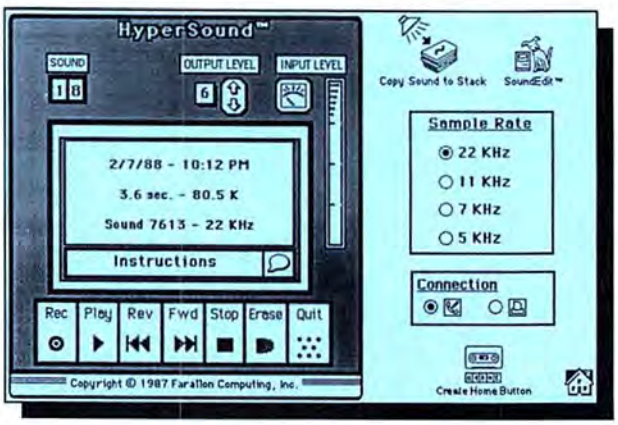
The most obvious difference between *SoundEdit* and *HyperSound* is that *SoundEdit* displays a graphic waveform that represents a sound when you set a level or immediately after you record. The waveforms let you edit sounds visually, once you learn how to read them. You can see immediately if you're recording at a level too low (the waveform is relatively flat) or too high. If the input volume is too low, everything will be a mushy blur. If the volume is too high, the waveform will "clip" or overmodulate — you see it pushing against the boundaries of the display area — and you won't capture all the subtleties of the sound. According to Farallon, the company wanted to include an autogain option that would automatically set an optimal recording level, but the inescapable noise of the Mac SE fan made this impossible.

> When you're setting levels, you can see a spectral analysis of the input to help you analyze the sound and set the correct input volume and microphone placement.

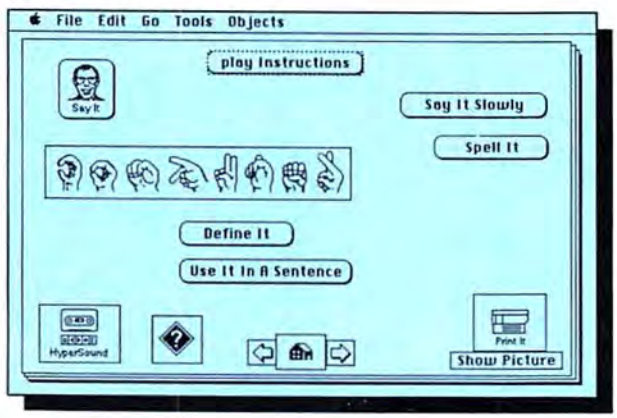
Using the mouse, you can select any portion of the waveform to work with or select the entire sound by double-clicking. One of the simplest editing tricks is to cut out any "dead air" at the beginning or end of spoken words. Silence may be golden, but it can also be sluggish, and it takes up as much memory as sound. Silence appears visually as a flat line, and you can usually guess where it begins and ends. Select this region and play it back to make sure it's "empty" and then use the CUT command to eliminate it. Using the same technique, you can trim the silence in between words to speed things up. Similarly, by copying and pasting duplicated chunks of speech, you can easily create "Macs Headroom" effects, for example. And you can splice together different "takes" to create a composite that combines the best parts of all your takes.

To make it easier to interpret the graphic, you can view the waveform as a continuous line or as a series of dots, and you can expand or condense the display scale. When you're setting levels, a spectral analysis of the input helps you analyze the sound and set the correct input volume and microphone placement. (Putting this in the language of home stereo equipment, with the Input Level display option selected, you see a readout that corresponds to a VU-meter; with the Spectrum Analysis display, you see the equivalent of an equalizer readout.)

Once your sound is recorded (or imported from *HyperSound* or another source), you're ready for *SoundEdit* to really cut loose. CUT, COPY, and PASTE can create powerful effects, but imagine using a word processor with just these basic commands. It would do the job, but it's no fun without fonts, type sizes, typestyles, and all the other goodies. If it's goodies you want, you'll find them in *SoundEdit*'s special-effects and mixing functions.



Each sound recorded in *HyperSound* gets its own card in the *HyperSound* stack. The card background looks and operates like a cassette tape recorder does, with the exception of the Forward and Rewind buttons. These move you to other cards in the stack. The Copy Sound to Stack button lets you move the recorded sound to the stack in which you want to use it.



This sample stack for teaching speech to the hearing impaired combines sound, graphics, and text. Each card shows a word spelled out in American Sign Language finger spelling (*computer* is shown on this card) and has audio buttons that pronounce the word, define it, and use it in a sentence.

LET THE WILD RUMPUS START!

For starters, how about an echo

chamber? Select the part of the sound you want to reverberate and choose ECHO from the Effects menu. A dialog box lets you specify how long the delay is between the sound and the onset of the echo and the *strength* of the echo — a term that refers both to the relative volume of the echo (compared with original sound) and to the amount of time until the echo dies out. Depending on how you adjust the parameters, the echo effect can be subtle or grotesque: A subtle reverb sounds as though the recording was done in a large room, and exaggerating the echo adds a comic emphasis to selected words.

The other special effects work in a similar fashion. AMPLIFY changes the output volume above or below 100% of the original value. (If you amplify too much, you'll irretrievably clip the "edges" of the sound, just as if you had recorded at a too-high volume.) BACKWARDS plays the sound in reverse, so you can sample all your albums and find out what's really being said behind the scenes. You can transpose the sound up or down in pitch with SET PITCHES. (Lowering the pitch also slows down the sound; raising the pitch speeds it up. Munchkin effects made easy.)

If you want to alter the pitch in a nonuniform way — up in some places, down in others — BENDER lets you draw a pattern to superimpose over the pitch of the sound. A tight zigzag line, for example, creates a tremolo effect. ENVELOPE works in a similar manner, but the line you draw affects the volume rather than the pitch. By adjusting the volume envelope, you can easily fade a sound in and out.

The FILTER command works like the equalizer on a stereo system and lets you boost or suppress any specified frequency range.

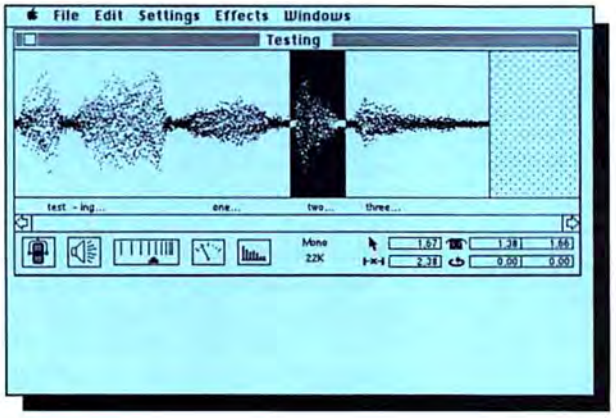
SMOOTH and FLANGER perform complementary functions. SMOOTH removes the rough, high-frequency percussive edges from a sound, such as pops and clicks (the audio equivalent of shooting a movie through a Vaseline-covered lens for a soft-focus effect). This is useful for touching up the rough edges between sounds you've pasted together. FLANGER, in contrast, adds some bite to sounds. It creates the effect of motion by superimposing a phase-shifted copy of the sound on the original. There are also some functions that let you create sounds from scratch, including white noise, silence, and rudimentary synthesized sounds.

Most of these effects can be undone (using UNDO), and you can always use REVERT to reach the last saved version of the sound you're working on, so you can feel free to experiment. Farallon has also experimented with SEARCH and REPLACE functions that can globally edit similar pieces of sound, but these functions are not implemented in the current release.

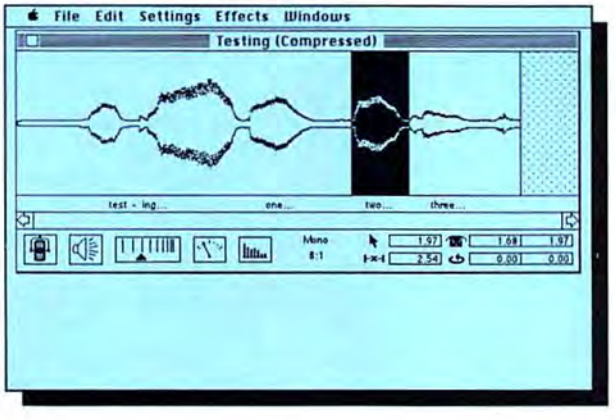
All these sounds — raw sounds, processed effects, and sounds created from scratch — can be mixed together and output onto one or two tracks (mono or stereo). The Mixer window lets you combine up to four independent sounds. First, highlight any part of a waveform and choose SELECT MIXER INPUT from the Settings menu. Your selection now appears as track 1 in the Mixer window. Up to three more waveforms can be laid down. You can slide the four tracks backward and forward to adjust the relative starting times for each. At any point, click Trial Mix to hear whatever is in the Mixer window. When everything is set, open a track for the mixed output, choose SELECT MIXER OUTPUT, and hit the Mix button. And, unlike real mixers and four-track recorders, you can bounce tracks around indefinitely without adding any noise.

Be forewarned, however. If you run low on memory, *SoundEdit* won't let you execute and save the final mix, even though it might have led you on by letting you hear a trial mix.

With a Mac II, you can record and play sounds back in stereo. This uses up twice as much memory and requires a second MacRecorder, but it can significantly enhance the final result. You can also record two tracks separately using one MacRecorder on



In *SoundEdit*, a graphic representation of the sound helps you select the right part of the waveform for editing.



Compressed sounds are displayed slightly differently. Compression increases the amount of recording time available and reduces the amount of disk space needed to store the sound.

any Macintosh. This isn't really practical if the two tracks have to be tightly synced — that is, if they're supposed to be two versions of the same sound recorded from two different microphone locations — but it's a reasonable technique if there can be some leeway in the timing of the two tracks.

TRUE TO FORM

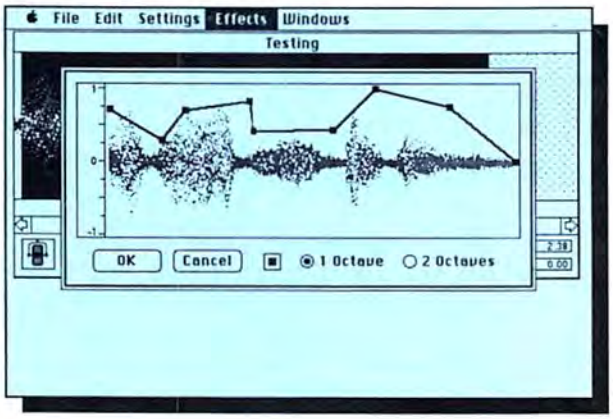
The last function of *SoundEdit* is less apparent but quite powerful: It's a sound-format translator. Just as graphics can be stored in a variety of formats (such as bit-mapped *MacPaint*, object-oriented *MacDraw*, PostScript, and TIFF), sound can be stored in different formats. And, as in graphics, there are ways to convert from one format to another without losing too much in the translation.

SoundEdit opens and converts sounds in three formats: SoundEdit, Resource, and Instrument. SoundEdit files appear on the desktop as separate files and can be opened by other applications, including *SoundCap*, *SoundWave*, and *VideoWorks*. Resource files do not appear on the desktop but instead are stored as part of an application that you select. Resources attached to *HyperCard* stacks are saved as type 2 snd resources; all others are saved as type 1 snd resources. Instrument files can be accessed by *Studio Session* and *Jam Session*, which use these sounds as instruments to play music generated in those applications. Farallon is also exploring a MIDI sampler format, although that may not be practical until a new MacRecorder with a higher sampling rate is available.

The MacRecorder hardware and *SoundEdit* software are similar to the Audio Digitizer and *SoundWave* software from Impulse (reviewed in the April '88 issue of *MacUser*). MacRecorder is easier to use. *SoundWave* can do most of the things *SoundEdit* does and a few it can't, such as let you graphically input a waveform just by drawing it or add your own custom-programmed functions. But *SoundWave* requires some *ResEdit* savvy to make the most of it, whereas MacRecorder takes care of most of the nitty-gritty details, particularly in *HyperSound*.

Occasionally, I experienced *System* crashes in *HyperSound*, but I never found a reproducible bug. Part of the blame for those crashes probably goes to *HyperCard* 1.0, which crashes fairly regularly on my Mac. But don't be surprised if the screen freezes when you push your RAM limits with a lengthy recording. *SoundEdit* sometimes got stuck in level-setting mode; unplugging the hardware from the modem port usually got it unstuck.

I can't think of much that's missing from MacRecorder. Some sort of cuing utility would help in assigning sound to *HyperCard* events that involve more than one sound and more than one card (that is, *HyperCard* "animation"). But you can do this fairly easily by trial and error: Look at the demo stacks to learn the simple Script commands needed to implement delays and pauses in *HyperCard*. If you want to get picky, it would be nice if there were a flip stand on the MacRecorder box that lets you adjust the angle at which the box rests.



The BENDER effect lets you alter the pitch of different parts of the waveform by drawing a line that represents the desired changes in pitch.



You can uniformly transpose the pitch using the SET PITCHES command.

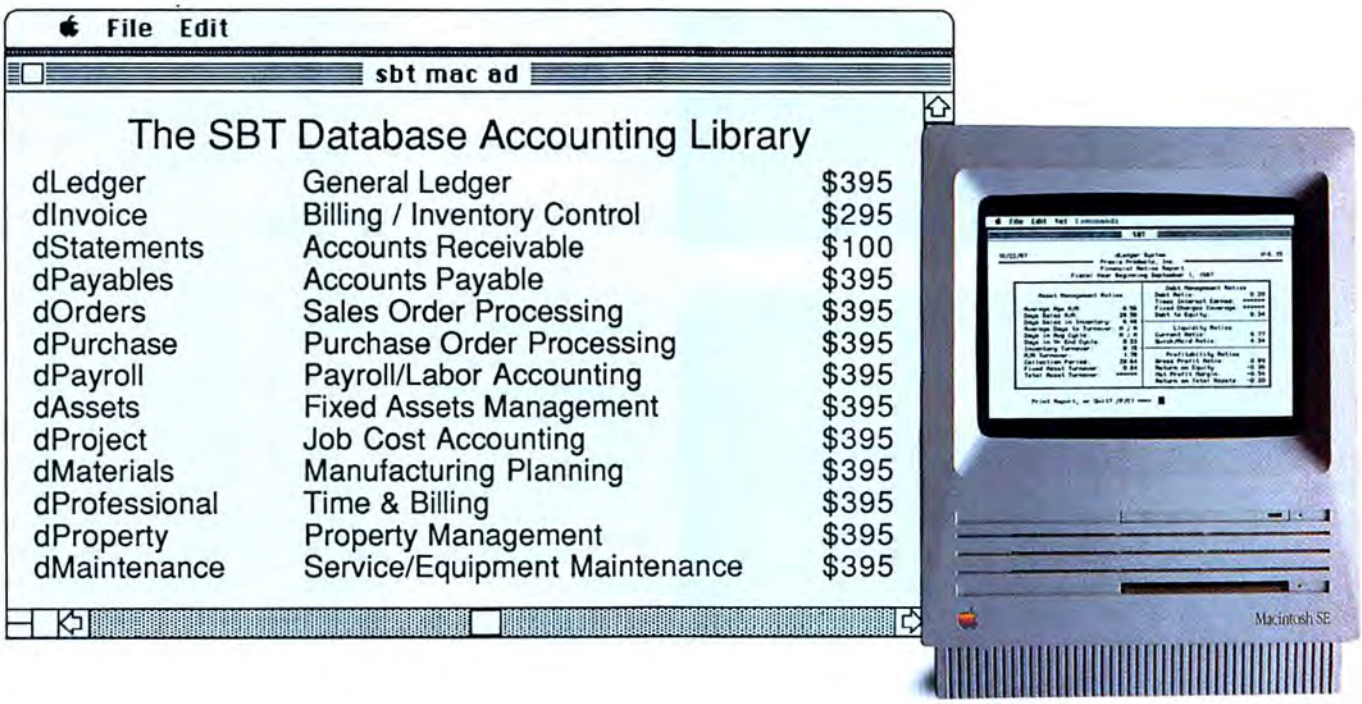
SOUND ADVICE

The manual explains each menu selection adequately, although it doesn't give many details or examples. (The index could be better, too — for example, "stereo" is listed under "recording, stereo.") Technical support is limited — the telephone support number is buried in the manual and, as of this writing, consists of one halftime, telephone-support person. When available, he was quite helpful and knowledgeable. (Other Farallon staff members can field the easy questions.)

You might be wondering why Farallon, a company primarily involved in networking products, developed a product such as MacRecorder. The product is a spin-off of development it's doing in Mac-based voice messaging and real-time intercom applications.

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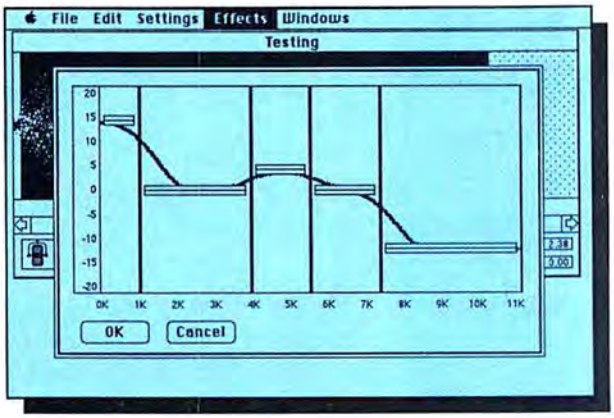
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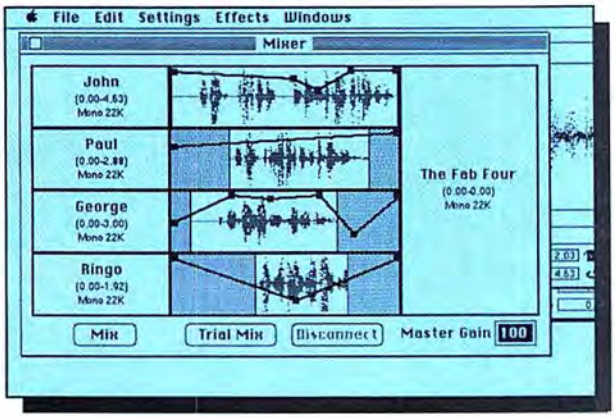
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The FILTER command acts like an equalizer, letting you filter out or boost specific audio frequencies.



The Mixer window lets you mix up to four tracks at once. You can adjust the volume of each track by drawing a line over the waveform that determines how that track will fade in and out. To mix more than four tracks, use the output from one mixdown as the input for the next.

this technology are intriguing. Imagine a word processor that lets you add spoken comments to a document, such as a reminder to check something, a question to the next person reading the document, or editorial changes for your secretary to enter. Or picture a spreadsheet that plays a trumpet fanfare whenever you click on the Grand Total cell.

Music is another area in which this technology offers real promise. But there are two crippling limitations on MacRecorder as it is now. First, the sampling rate is too low. More severe is that the entire sample must be kept in RAM, so you can't record very lengthy tracks. Upping the sampling rate shouldn't be too difficult, although it would cost somewhat more. And it seems feasible that with a custom Mac II board perhaps, you could dump the sample from a buffer in RAM to a hard disk in real time, while you're still recording. If you could do that, your time limit would be disk-limited, not RAM-limited. Sampling at 44 kHz in stereo, even a modest 20-megabyte hard disk has enough memory to serve as a buffer for almost four minutes of compact-disc-quality music. Desktop direct-to-disk digital recording — for acoustic instruments, not just MIDI — could be on the horizon.

SOUND EFFECTS

For any stack or application, MacRecorder makes it simple to add sound to the Mac interface. Hearing the screen affects the way you interact with your Mac because you don't have to sit with your eyes glued to the screen. You can turn your head. You can talk to your Mac and occasionally hear someone talk back.

It's a more human experience, and that's always desirable. But I think three sensory channels — sight, touch, and MacRecorded sound — are enough for now. I don't think the world is ready for a scratch 'n' sniff desktop.

FEATURES EDITOR JON ZILBER THINKS ALL CHILDREN SHOULD BE ISSUED WITH THEIR CHOICE OF A MACPUKE INIT OR A JOHN CLEESE "SPAM" INIT AT BIRTH.

MACUSER RATING

MacRecorder ★★★★½

Follows Mac Interface	■ ■ ■ ■ ◧
Printed Documentation	■ ■ ■ ◧ □
On-Screen Help	None
Performance	■ ■ ■ ■ ■
Support	■ ■ ■ ◧ □
Consumer Value	■ ■ ■ ■ ■

Comments: MacRecorder digitizes any sound and converts it to Sound Resource, File, and Instrument formats. *HyperSound* turns sound into *HyperCard* buttons, and *SoundEdit* provides a wealth of special-effects and mixing capabilities. **Best Features:** Hardware is compact, software is simple to use; stereo recording is possible on a Mac II. **Worst Feature:** Length of each recording is severely RAM-limited unless you're willing to sacrifice audio quality. **List Price:** $199. Published by Farallon Computing, 2150 Kittredge Street, Berkeley, CA 94704; (415) 849-2331. Requires 512K. Software not copy protected.

How to Lose Friends and Irritate Co-workers

It's easy to substitute your own MacRecorder sounds for the Mac's default "beep" sound or to add a customized start-up sound. The Mac II has a cdev for changing your beep sound; on other machines, you'll need copies of *Beep Init* and *Sound Init*, two public-domain programs widely available through user groups or on bulletin boards. (To locate the user group nearest you, call Apple at (800) 538-9696, extension 500.) Put these two programs in your *System* folder. Save (or convert) your recorded sound as a *SoundEdit* file and rename it StartupSound or BeepSound (with no spaces between words), put these files in your *System* folder, and restart your machine.

Just remember: There's an art to choosing appropriate beep and start-up sounds. Keep them short and sweet; your neighbors, spouse, pets, and co-workers will thank you.



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Quick on the Color Draw

The Macintosh II and Color QuickDraw made Mac color a reality. Here's how it all works.

BY SCOTT KNASTER

The following is a chapter excerpted from Macintosh Programming Secrets *Copyright© 1988 Scott Knaster. Suggested retail price $24.95. Available from wherever computer books are sold, or directly from Addision-Wesley, Route 128, Reading, MA 01867, (617) 944-3700.*

There's so much new stuff in QuickDraw to support color that it's been renamed Color QuickDraw. Color QuickDraw lets you do everything you could do with the original classic QuickDraw, plus the following new fun features.

- You can draw anything in 16 million different colors, give or take a few hundred thousand, and you can display up to 256 different colors at a time using standard Apple hardware.
- The user can choose how much color, if any, is displayed. If the monitor isn't color, gray scales will be shown automatically.
- There are new transfer modes to do fancy new things with colors, like blending them together.

There are actually several pieces of hardware and software that work together closely to give you what you see on the screen. When you program, you usually call one of the Toolbox managers or QuickDraw, asking for the colors you want. QuickDraw then calls on a new piece of the Operating System called the Color Manager, which knows how to translate what QuickDraw wants into what the monitor can actually provide.

The Color Manager then communicates with the monitor by making calls to its driver, which is usually supplied on a ROM on the video card that runs it. On the Macintosh II, there's no built-in video, so every monitor is connected to a card that's in one of the six NuBus slots inside the box. The driver actually turns on the little bitty lights that form the images you see on the monitor.

This new version of QuickDraw is present in the Macintosh II ROM only, for two reasons. First, this is the only Macintosh that has an Apple-supplied color monitor. Second, Color QuickDraw uses 68020 code heavily and the Macintosh II is the only Macintosh that comes with a 68020 built in.

COLOR BASICS

In the original version of QuickDraw, every bit in the RAM that's dedicated to the screen controls one pixel. Since a single bit can have two values, 0 and 1, every pixel can show two things, white or black. On Macintoshes with a 512 x 342 pixel black and white screen, there are exactly 175,104 pixels (multiply it yourself if you don't believe me); at eight bits per byte, that means that there's exactly 21,888 bytes of RAM devoted to the video screen.

In Color QuickDraw, every pixel must be able to show more than just black and white. This means that one bit is no longer enough to hold the contents of a pixel. The

number of different colors that a single pixel can display is determined by the number of bits in memory dedicated to that pixel. For example, with two bits per pixel, we can have four different bit patterns, representing four different colors. Eight bits per pixel produces 256 different colors, the maximum that Apple's color monitor will allow.

On the Macintosh II, the actual colors that will be displayed on the screen are determined by the monitor's driver and the hardware itself. As a programmer, you don't have to know anything about the video capabilities to work well with different kinds of screens. When you draw in color, you specify each color by giving an intensity value for the red, green, and blue components of the color. The three numbers that you get when you specify a color like this are called the RGB value of the color, named after Reinhardt G. Barnsfarfle, the inventor of the puce scroll bar.

The red, green, and blue components are each 16 bits, which means that you get to use three different numbers ranging from 0 to 65535. For each value, 0 indicates that one of that color will be used and the maximum value of 65535 means that the full intensity of that color will be added to produce the final result. This means that you specify an intense green with an RGB value of 65535 for the green component and 0 for the blue and red parts. An RGB with a red value of 65535 and blue and green settings of 0 will create a rich, full-bodied red, with a fine flavor and a good bouquet.

Before pixels are displayed on the screen, the colors are determined on the basis of the RGB values that you ask for. Since you can specify 281 trillion different RGB values and only 265 different colors can be displayed at once on most color monitors, there's obviously some mapping taking place. It works like this: when you draw, you ask QuickDraw to use your favorite RGB values; QuickDraw asks the Color Manager for the available color that comes closest to the one you asked for and then draws in that color.

How are the available colors determined? Most of the monitors that work with a Macintosh II have the ability to match RGB values to colors by using a color lookup device, which lets you change which colors are available for use on a monitor at any given item. On the video card that controls Apple's color monitor, there's a color lookup device that allows any 256 of the 16 million colors to be used at once. Usually, this color choosing is done by the system, but if you want to get tricky, you can change it by using the Palette Manager, a new part of the Toolbox that controls color usage.

When you write your application, you have no way of knowing the specific color environment that your user will have. Not only are there zillions of different monitors available, but the user can change the number of bits of color information per pixel by using the Control Panel. If you had to worry about all of this when you were programming, you'd go nuts.

Luckily, the system handles all this for you. When your application draws, QuickDraw and the Color Manager will find the best match for the colors you want based on the current monitor, video card, and user settings. If you try to draw in 256 different colors while the user has the monitor set for four-bit color, QuickDraw and the Color Manager will map each of your 256 requested colors into the nearest match from a color lookup table that has 16 colors (the maximum number you can specify with four-bit values). The same things will happen if the user has set the monitor for gray scales. The worst case is one-bit mode, in which all colors except white will be displayed as black.

COLOR DRAWING MODELS

The original version of QuickDraw actually supported color output; it must have been pretty interesting trying to test it. In this version, you could specify that you wanted to draw in any of eight different colors, including black and white. The idea was that for black and white (one bit per pixel) devices, all the non-white colors would just become black, but for devices that could use color information, eight different ones could be specified. Color QuickDraw in the Macintosh II supports this technique, which is doomed to be known forever as the old model of color drawing.

To draw using the old model, a programmer can choose from the eight colors by using the ForeColor and BackColor procedures. These procedures let you decide which colors you want selected for foreground and background drawing operations. They're very simple to use: for example, to draw a blue rectangle, just call ForeColor (blueColor), then PaintRect.

A few clever applications actually started using this technique to draw as early as 1984, anticipating the day when QuickDraw would really be able to draw in color. If they did it right, these programmers had the thrill of seeing things work in color on the Macintosh II.

For the nifty color hardware of the Macintosh II, eight colors just aren't enough, of course. As we just discussed, Color QuickDraw lets you specify an amazing number of different colors with RGB values. These colors are

True Colors

If you're a fan of combinations and permutations, you may have figured out that if the red, green, and blue components of an RGB can each range from 0 to 65535, there are 65536 times 65536 times 65536, or 281,474,976,710,656 (that's 281 trillion, sports fans) different combinations of RGB values. Does this mean that QuickDraw can display all those different colors? Yes and no. Yes, you can specify any of the 281 trillion colors when you draw. No, the current combination of QuickDraw and the available color hardware can't handle it. For example, colors on the Apple color monitor are mapped according to the upper eight bits only of each RGB component; this means that colors are limited to a much narrower selection of just 16,777,216 different values, which is enough to give a different color to every person in Czechoslovakia.

matched with available ones from a lookup table to decide what to show on the screen, and the number of available colors varies depending on the color hardware and the user's settings.

This technique of choosing colors by using RGB values is called the new model. For programs that want to take advantage of Color QuickDraw, the new model is obviously the only way to go. When you're using the new model, you choose colors by calling RGBForeColor and RGBBackColor. These work like their relatives from the old country, ForeColor and BackColor, in letting you set up foreground and background colors, but they take full RGB values as parameters.

When you write your application, you have a choice to make about compatibility. If you use routines that are in Color QuickDraw only, your application will crash if it's run on anything but a Macintosh II. So, you have to decide whether you want to take full advantage of Color QuickDraw, which will limit your application to just Macintosh II, or whether you should stick with the eight old-model colors and remain compatible with the black and while Macintoshes, since all versions of QuickDraw understand ForeColor and BackColor. You can also choose to write code that handles each case separately. The choice depends on how much you want your program to do and who you expect to use it. The right choice is the one that fits your situation.

COLOR STRUCTURES

QuickDraw uses a whole bunch of new data structures to implement its new color features. Most of them have counterparts that serve similar functions in the original version of QuickDraw. In this section, we'll show each data structure, discuss its field, gossip about it, and find out what the heck it does.

The basic color data structure in the Macintosh II is the RGB record. This is simply a record composed of red, green, and blue values. It looks like this:

```
type RGBColor = Record
                    red: Integer;
                    green: Integer;
                    blue: Integer;
                end;
```

Each field in the RGB record simply defines the magnitude of that color. As we said earlier, setting all three integers to 0 produces black, while the maximum value for each will create white.

The color stuff on the Macintosh II uses lookup tables extensively to translate various kinds of index values into RGB values. For example, the values for each pixel you draw are mapped into their RGB values through a lookup table associated with the image. To create these lookup tables, QuickDraw defines a color specification record, which combines an RGB with an integer that's used as an index or other reference value. The color specification record is declared this way:

```
type ColorSpec = Record
                    value: Integer;
                    rgb: RGBColor;
                end;
```

A color table is built by gluing together a bunch of color specification records; plus a couple of new fields:

```
type ColorTable = Record
                    ctSeed: Longint; {usually not used}
                    transIndex: Integer; {usually not used}
                    ctSize: Integer; {entries minus 1}
                    ctTable: array {0..0} of ColorSpec;
                end;
```

CTSeed provides a color table with a unique identifier. Usually, color tables you use will be attached to some other date structure, such as a window or pixel map, and the ctSeed field will not be used. The transIndex field can be used with some Color Manager calls to set a "transparent" pixel in each color table.

The heart of the color table is in the last two fields. CTSize tells how many colors are mapped by this table, minus one (the Color Manager starts counting at zero), and ctTable contains the actual color specifications, each one including an index value and an RGB.

These color tables are used all over the place in the Macintosh II. Virtually every manager in the Toolbox uses a color table to map parts of its structures to RGB colors; for example, the Control Manager has one that tells how to colorize each part of a control.

Pixel Maps and Pixel Patterns: The next new concept we'll talk about is the pixel image. In the original QuickDraw, a bit image is defined as a bunch of bits that represent an image enclosed by a rectangle. Color QuickDraw extends this definition to create the concept of a pixel image, which is a collection of bits that represent an image that may have more than one bit of information per pixel.

Color QuickDraw defines a data structure called a pixel map, which describes a pixel image and associated information in the coordinate plane. The original QuickDraw bit map, a direct ancestor of the pixel map, was a pretty simple structure, containing just three fields. The pixel map tells a lot more: its first three fields are similar to the ones in a bit map, but there are 12 additional fields filled with information. Here's the structure of a pixel map:

```
type PixMap = Record
                baseAddr:Ptr; {pointer to pixel image}
                rowBytes:Integer; {offset between rows}
                bounds:Rect; {boundary rectangle}
                pmVersion:Integer; {version ID, currently 0}
                packType:Intger; {packing format, currently 0}
                packSize:Longint; {size of packed image}
                hRes:Fixed; {horizontal pixels per inch}
                vRes:Fixed; {vertical pixels per inch}
                pixelType:Integer; {currently 0}
                pixelSize:Integer; {number of bits per pixel}
                cmpCount:Integer; {currently 1}
                cmpSize:Integer; {bits used per RGB}
                planeBytes:Longint; {currently 0}
                pmTable:CTabHandle; {handle to color table}
                pmReserved:Longint; {currently 0}
              end;
```

There's a lot of new stuff in there. BaseAddr is a pointer to the start of the pixel image in memory, just as in a bit map. RowBytes defines the number of bytes in RAM needed to get from one row to the same pixel position in the next row.

The first three fields of a pixel map look just like a bit map and you can substitute one for the other in various places, so Color QuickDraw uses a flag to indicate that you've got a pixel map: it sets the high bit in the rowBytes

field. Since this field is an integer, this is the same as adding 32768 (or $8000 hex) to the value of rowBytes.

The bounds field, just like in a bit map, encloses the pixel map and also defines its coordinate system. The pmVersion field tells which version of QuickDraw created this pixel map; for the first version of Color QuickDraw, this is 0. Note that "currently" in the pixel map declaration above means that this is how it works in the first version of Color QuickDraw.

PackType and packSize are used if the pixel image is packed. Currently, pixel maps are unpacked, so both of these fieldS are set to 0. The hRes and vRes tell the horizontal and vertical number of pixels per inch. Usually, these values are both 72. PixelType is used to indicate how the pixel image is arranged in memory. Color QuickDraw always uses adjacent bits in memory to form each pixel; this is called the chunky format and is indicated by a zero in pixelType. Other formats may be supported in the future that separate the pixel image into planes with each plan containing one bit of information per pixel, an arrangement called planar.

The pixelSize field is used to tell how many bits per pixel are in the pixel image. This is called the depth of the image. CmpCount tells how many RGB values, or components, are used to make up each pixel. Although QuickDraw currently provides one RGB per pixel, future versions could allow more to provide greater resolution and cmpCount will show how many are being used.

CmpSize indicates how many bits of RGB information are used to draw this pixel map. Since one bit of depth is needed for each bit of RGB information, this field is the same as pixelSize. PlaneBytes isn't used now; if QuickDraw ever supports planar pixel images, it promises to give the offset from one plane to the next.

PmTable contains a handle to a table of colors that's used by this pixel map. It matches pixel values to RGB colors. The last field, pmReserved, isn't used by the current version of Color QuickDraw and it should always be set to 0.

The Macintosh II version of CopyBits can be used to manipulate pixel maps as well as bit maps. This is where that handy flag in the high bit of rowBytes comes in. When you call CopyBits, it can tell whether it's dealing with a bit map or a pixel map by checking this bit. If it's a pixel map, it learns the depth from the pixelSize field; bit maps always have a depth of 1, of course.

When you use CopyBits, it will examine the depth of the source and destination bit maps (or pixel maps). If they're not the same depth, it will automatically adjust the source's depth to the destination's. So, you can copy from pixel maps to bit maps and the other way around. Of course, if you go from a multibit pixel map to a bit map, you'll lose all the color information since there's nowhere to keep it. CopyBits will make sure the image remains intact, in black and white anyway.

The next new idea is a new kind of pattern. In the original version of QuickDraw, a pattern is an 8 by 8 bit image that defines a design or texture that's repeated to fill an area on the screen. Color QuickDraw defines a pixel pattern as a pixel image of virtually any size, and containing color information, which can be repeated to fill screen areas. Pixel patterns can also simulate old-version patterns, if necessary.

This is the definition for a pixel pattern:

```
type PixPat = Record
                patType: Integer; {indicated b & w or color}
                patMap: PixMapHandle; {handle to pixel map}
                patData: Handle; {handle to pixel image}
                patXData: Handle; {used internally}
                patXValid: Integer; {valid pattern flag}
                patXMap: Hanlde; {used internally}
                pat1Data: Pattern; {old-version pattern}
              end;
```

The patType field tells what kind of pattern this is. There are three possibilities: 0 specifies an old-version, black and white pattern; 1 indicates a full color pattern, which can have a wide mix of colors; and 2 is for an RGB pattern, which is a pattern based on a single RGB value.

Creating RGB patterns is especially useful for simulating more colors than you actually have. By using a technique which alternates colors in adjacent pixels, your screen can appear to have a new color. This is called dithering. For example, by dithering blue and green, you can simulate a single blue-green color. Of course, this only works when you're drawing more than one line, which is why it can be used with patterns. If you draw just one line or just one pixel, it will appear in just one color.

PatMap contains a handle to a pixel map. All the fields in this pixel map are used to define the characteristics of type 1 (full color) patterns, except for baseAddr. Instead of using baseAddr to point to the pixel image, patData is a handle to the pixels, for easy access. The other fields of the pixel map in patMap give other information about the pattern's pixel image, such as its size, depth, color table, and so on.

The pattern can be used with screens of any depth, so it must be expanded or contracted when a screen with a new depth is encountered. To speed up drawing with the pattern, QuickDraw will keep a copy of the pattern in the current screen's depth in the patXData field. Whenever the current screen's depth is changed, patXData has to be rebuilt. PatXValid indicates whether the current patXData has to be rebuilt; it's -1 if it does and 0 if it already has the right pattern.

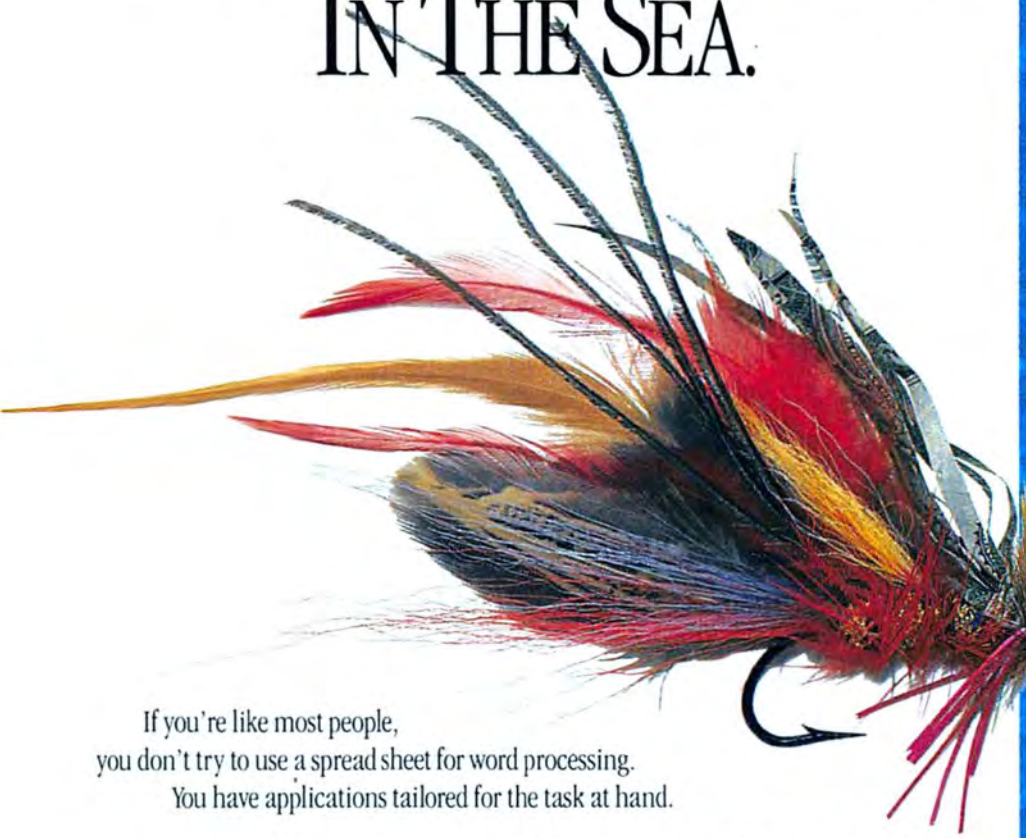
PatXMap is used internally by QuickDraw. The last field, pat1Data, contains a copy of the pixel pattern represented as an old-version bit pattern. This is used by QuickDraw for fast pattern drawing when bit patterns are needed.

You can use the patXValid field if you want to change the pattern or its colors. After you make the change, just set patXValid to -1. This will make QuickDraw rebuild the patXData before it draws with the pattern, just as if the screen depth had changed.

Color Grafports: All drawing in QuickDraw is done in grafports, which define the rules and environment for the drawing. Color QuickDraw adds a new kind, a color grafport, that lets you take full advantage of the Macintosh II's color capabilities. If you're using the old model of col-

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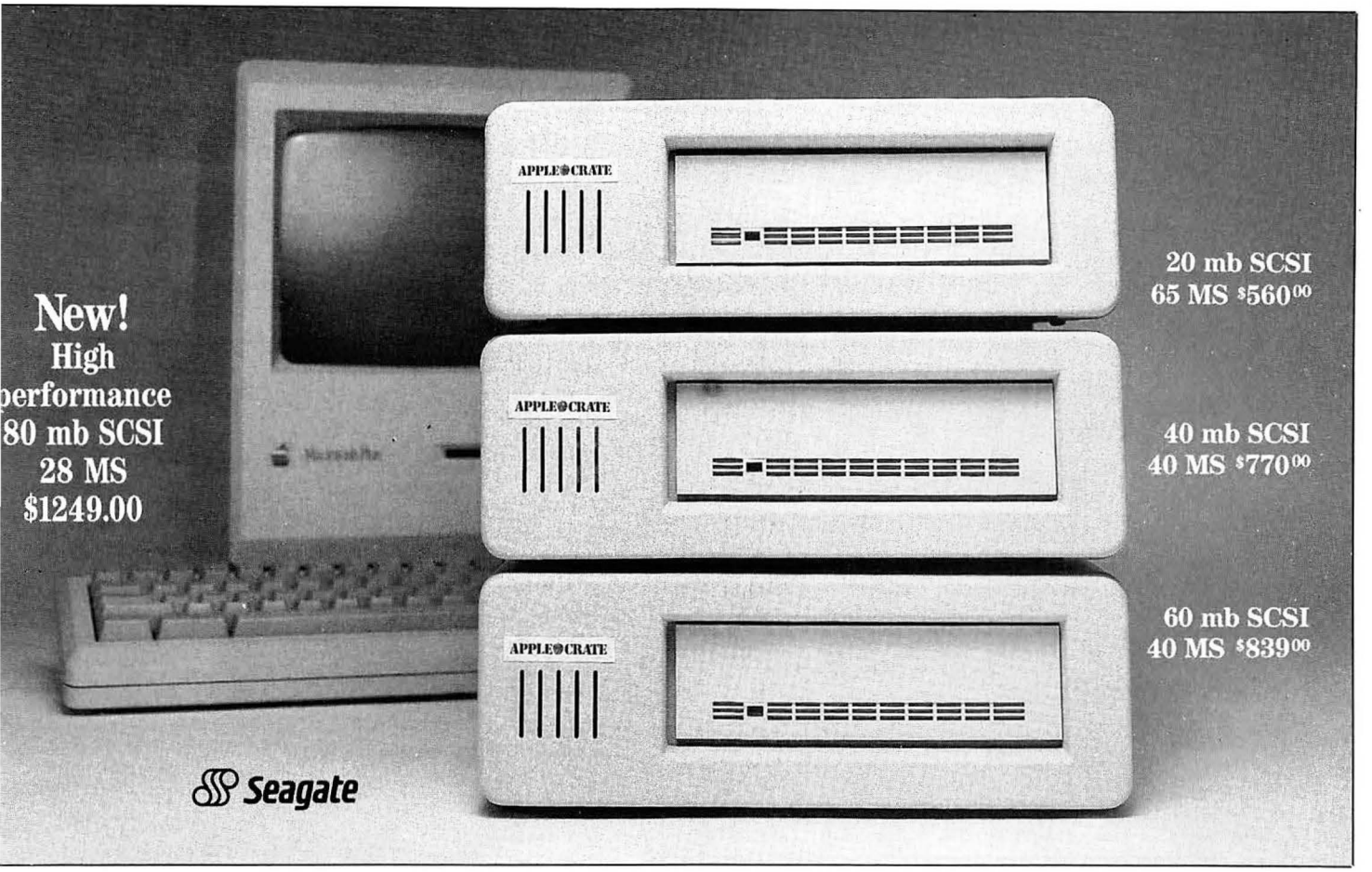
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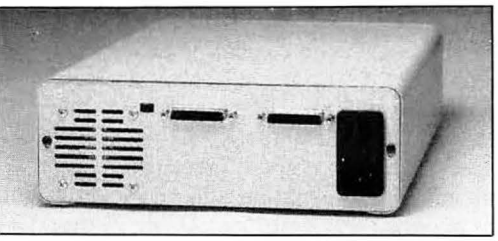


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or drawing (eight colors), you can use an old-version grafport. To Draw using RGB colors, you'll need a color grafport.

When you create a window, a grafport is contained in the window record, and all drawing in the window is done with this grafport. The Window Manager in the Macintosh II lets you open a new window with either an old-version grafport or a color grafport. This choice determines which color model you can use, since old-version grafports can only support the eight old-model colors.

Here's the structure of a color grafport:

```
type CGrafPort = Record
                   device: Integer;
                   portPixMap: PixMapHandle;
                   portVersion: Integer; {QuickDraw version}
                   grafVars: Handle; {more fields}
                   chExtra: Integer; {fractional spacing}
                   pnLocHFrac: Integer; {for fractional text}
                   portRect: Rect; {usable rectangle}
                   visRgn: RgnHandle; {same as in GrafPort}
                   clipRgn: RgnHandle; {same as in GrafPort}
                   bkPixPat:PixPatHandle; {background pixPat}
                   RGBFgColor: RGBColor; {foreground color}
                   RGBBkColor: RGBColor; {background color}
                   pnLoc: Point; {old stuff follows}
                   pnSize: Point;
                   pnMode: Integer;
                   pnPixPat: PixPatHandle; {pen pattern}
                   fillPixPat: PixPatHandle; {fill pattern}
                   {remaining fields same as GrafPort}
                 end;
```

Lots of the fields in a color grafport are the same as they were in the original so we'll just talk about what's new. It's interesting to note that a color grafport is exactly the same size as an old-version grafport. How can this be, if it has to hold all this new color information? The answer is that several fields that were found directly in the grafport are now stashed in relocatable objects and handles to them are stored in the color grafport.

Specifically, the portBits, bkPat, fillPat, and pnPat fields have been replaced by handles: portPixMap, bkPixPat, fillPixPat, and pnPixPat. Handles take up four bytes each, so these four handles use up a total of 16 bytes. Bit maps consume 14 bytes, and patterns take up eight, so these four fields in old-version grafports use 38 bytes. That leaves 38 minus 16 or 22 bytes for new stuff and all of them are used.

The portPixMap field replaces the portBits field in an old-version grafport. It's a handle to the pixel map associated with this grafport. PortVersion is used to tell Color QuickDraw if this grafport is color or not. If it's a color grafport, this field should have its high two bits set, which is decimal 49152 and hex $C000. For old-version ports, this is the rowBytes field of the portBits record, which should always have its high two bits clear. This is how Color QuickDraw determines whether to treat the grafport as a new one or not, so it's very important that it be set correctly.

To cram more stuff into the color grafport, the grafVars field was invented. It contains a handle to seven more fields that didn't fit into the main part of the grafport. We'll look at these additional things right after we're done examining the grafport itself.

The next two fields, chExtra and pnLocHFrac, are used when drawing characters with fractional pixel widths. ChExtra is used to specify the amount to add to the width of each non-space character, which allows you to simulate proportionally spaced text on the screen. PnLocHFrac contains the fractional component of the horizontal pen position for drawing text.

The next three fields are the same as in an old-version grafport, so we won't talk about them here. BkPixPat is a handle to a pixel pattern that's used for background filling operations in the grafport, such as EraseRect. RGBForeColor and RGBBackColor contain the RGB values for the foreground and background colors in the grafport. They're the modern version of the fgColor and bkColor fields in an old-version port.

After the RGB colors, there are three more fields that do the same thing as in a non-color grafport. The remaining two new fields are pnPixPat, which holds a handle to the pattern used for drawing in the grafport, and fillPixPat, which holds the pattern used when you make one of the new calls that fill an object with a pattern, such as FillCOval or FillCPoly. In addition, when you make one of the old filling calls that work with bit image patterns, like Fill Rgn or FillOval, the pattern is stored in the pixPat record at the end of the fillPixPat handle.

Now let's talk about the additional things in the grafVars field:

```
type GrafVars = Record
                  rgbOpColor: RGBColor; {for transfer modes}
                  rgbHiliteColor: RGBColor; {for hilite mode}
                  pmFgColor: Handle; {Palette Mgr foreground}
                  pmFgIndex: Integer; {foreground index}
                  pmBkColor: Handle; {Palette Mgr background}
                  pmBkIndex: Integer; {background index}
                  pmFlags: Integer; {Palette Mgr flags}
                end;
```

The rgbOpColor field is used by Color QuickDraw's new arithmetic transfer modes, which allow you to combine colors in very interesting ways such as adding and blending. RGBHiliteColor is used to highlight an object by drawing it on a colored background so that it looks as if it were colored with a highlighting marker. This method of highlighting can be set when you use the invert calls (InvertRect, InvertArc, and so on). To use it, you have to clear the high bit of the low memory global HiLiteMode; there's no easy-to-use trap call that will clear this bit for you.

The last five fields of the grafVars record are used by the Palette Manager, a Macintosh II invention. On most Macintosh II color monitors, the current set of colors is determined by a color table and at any one time a comparatively small number of colors are available from a huge possible number (on Apple's monitor, it's 256 out of 16 million). With *MultiFinder,* lots of different programs can be sharing the screen.

If each program went around blasting the color table whenever it wanted a new color, there could be chaos. The Palette Manager was created to provide a central clearinghouse for all applications and desk accessories that want to use a specific color. The Palette Manager provides a higher level of access to colors. You can specify the colors you want in your application and the Palette Manager will try to provide them with a minimum of dis-

ruption to the other applications using the screen. You even get to attach a priority to your color request, and you can be as courteous or as demanding as you like when asking for your colors.

Color Cursors and Pictures: The original QuickDraw definition of a cursor allowed for a 16 by 16 bit image, in black and white. In Color QuickDraw, a cursor is still the same size, but a pixel image is used to define it, so it can have color information. This is the declaration for a color cursor:

```
type CCrsr = Record
               crsrType: Integer; {color or b&w cursor}
               crsrMap: PixMapHandle; {handle to pixel map}
               crsrData: Handle; {handle to pixel image}
               crsrXData: Handle; {used internally}
               crsrXValid: Integer; {valid cursor flag}
               crsrXHandle: Handle; {future}
               crsr1Data: Bits16; {old-version cursor}
               crsrMask: Bits16; {mask for drawing cursor}
               crsrHotSpot: Point; {point aligned with mouse}
               crsrXTable: Longint; {used internally}
               crsrID: Longing; {used internally}
             end;
```

The crsrType field tells what kind of cursor it is: 32768 is used for a bit image cursor, -32767 indicates a color cursor. CrsrMap contains a handle to a pixel map and the cursor uses all the pixel map's field except baseAddr, just as pixel patterns do. The main use for this is to define the cursor's color table.

The next few fields are also used like their counterparts in a pixel pattern. CrsrData is a handle to the pixel image for the cursor; crsrXData contains the cursor image refitted to match the current's screen's depth; crsrXValid tells if the crsrXData field is correct; crsr1Data contains a bit map cursor that can be used with old-version grafports.

CrsrMask does the same thing as the mask field in an old-version cursor: it defines what happens under the cursor as it moves over the screen. CrsrHotSpot anchors the cursor to the mouse point, just as with old-version cursors.

QuickDraw's definition of a picture has been extended so that color stuff can be recorded. In the original version of QuickDraw, each operation was represented by an operation code or opcode that's one byte long. To allow for a greater number of opcodes, this field has been expanded to two bytes in Color QuickDraw.

To distinguish between these two versions of pictures, there's a handy version opcode that should be the first thing in all pictures. The version opcode is hex $11, so all old-version pictures start with $11 01, which indicates version 1. New-version pictures start with a new opcode that flags them to QuickDraw. Quick Draw is very flexible in dealing with color in pictures. Old-version pictures can use the old model calls, ForeColor and BackColor, and new pictures can use the full range of color calls. An old-version picture with color can be drawn in either kind of grafport with no problems. A new-version picture, which can have RGB colors, pixel maps, pixel patterns, and other color things, can also be drawn into a old-version grafport. The new version of DrawPicture automatically best-cases Color QuickDraw operations in an old-version grafport. Here's what it does:

- Pixel patterns are replaced by bit patterns that simulate the intended effect as closely as possible.
- RGB colors are mapped to the old-model eight colors, again as closely as possible.
- Pixel maps are drawn by CopyBits, which adjusts to the appropriate screen depth.

Because of the smart new version of DrawPicture, new-version pictures that were recorded in full RGB colors on color grafports can be drawn into old grafports. If they're running on a Macintosh Plus or SE, they'll be in black and white; on a Macintosh II, they can show colors.

THINGS TO REMEMBER

Color QuickDraw is a clever new implementation of the classic Macintosh drawing system that supports both the old ways of doing things and new techniques for adding color to your life. You can mix old-version grafports, bit maps, patterns, and pictures with new ones. You have to be careful about using new Color QuickDraw calls, since they'll only work on a Macintosh II, but in general QuickDraw is pretty good about allowing you to mix old and new.

Color QuickDraw decides which colors to draw in by using lookup tables. These tables attach an RGB color value to every set of bits that describes a pixel. Ultimately, the actual color displayed on the screen comes from a color lookup device, which is usually on the monitor's interface card.

The RGB model, as implemented by QuickDraw, allows you to specify 48 bits of color information, or more than 281 trillion different colors. The current version of QuickDraw, used in conjunction with Apple's monitor, can display 16 million of those colors; any 256 of them can be on the screen at the same time.

The current implementation of QuickDraw uses the chunky bit arrangement, which groups all of a pixel's bits together in memory. Future versions may include support for the planar model, which separates the pixel image into a set of one-bit-deep plans.

You can write general-purpose color drawing code that will work correctly on all Macintoshes, if you stick to the old model of color drawing. To use the full features of the Macintosh II's color capabilities, you either have to write special-case code or sacrifice compatibility.

You'll find Listing 3-1 next. If you're interested in a program that provides a simple example of how you can use the old model and get eight colors but still be compatible with non-color systems without having to write special code, refer to pages 112-125 in the book *Macintosh Programming Secrets*.



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Chairman of the Keyboard

A guide to keyboard repair — closed-captioned for the mechanically impaired

On that summer Sunday, I was working at a sleepy country retreat, as far from an open Apple dealer as I was from the asteroid belt. I was racing against the clock, in the thick of setting up a database to manage an international gathering, when my M key stopped working. Click, click, click . . . no M. How long could I work before I needed an M? Seconds. I took a break. I came back. It didn't.

That day, I progressed from total ignorance to solving my problem before supper, and in doing so I thought of all those millions of Mac keys waiting to join my M in some broken-key Twilight Zone. Necessity forced me to take screwdriver in hand, overcome my fear of hardware, and cure my Mac of keynomoritis.

If you've had your Mac 128K, 512K, or Mac Plus for a few years and a key on it periodically misses a beat, chances are that it will get worse and eventually fail completely. Maybe in a month, perhaps a week. You never know. But as sure as your nose presses against your next deadline, that key will go dead. And if Murphy has anything to say about it, it won't be the \or the @; it will be the E, the comma, the tab, or the Command key. As an added comfort, you should know that any key or cable can cease functioning completely with no warning.

At the first sign of a missed stroke, run some quick checks. First make sure that your keyboard cable is properly seated at *both* ends and that most of your keys write to the screen. If none of the keys do anything, your cable may be the problem.

THE CASE OF THE DISABLED CABLE

Cable troubles usually develop at the connectors. These and their attached cable are routinely tugged, kinked, and flexed. One or more of the four inner wires can come invisibly loose from the connector. Replacing the Mac cable with a telephone-handset cable won't work because Apple in its wiz-dumb used a reversed four-wire connection. Official replacement cables cost about $14 at Apple dealers. But you can buy a handset cable at a Radio Shack, hardware store, phone store, drug/specialty store, and even some supermarkets. Remove one connector, flip it over, and reinstall it.

GETTING AN URGENT CABLE

In the absence of new cables or spe-

BY SALVATORE PARASCANDOLO

cialized tools, you can remove a connector by lifting the gold contacts one by one with a thin pointy object such as a finishing nail, large safety pin, splinter tweezers, or the pointy side of a drawing compass. Figure 1 depicts the removal technique. Lift the contacts just enough to free the cable. Be patient and careful, and it will work.

It's best to cut off, cleanly and squarely, the last ½ inch of exposed cable, which is the most strained segment. Next, trim off ¼ inch from its outer jacket, as shown in Figure 2, to expose the four inner wires.

To install a connector, insert the prepared cable into the (new or old) connector, making sure that the four colored wires are oriented as shown in Figures 3 and 4. It's important that both end connectors are wired *identically.*

Now hold the connector in a sturdy corner, such as a floor-wall joint, countertop, or the inside of a drawer, and use a 3⁄16-inch or 1⁄8-inch common flat-blade screwdriver to press down firmly each of the four gold contacts so it pierces its respective wire (see Figures 3 and 4). Do your best not to mangle the plastic separators. Repeat the pressing cycle to ensure good connections. If all went well, you're back in business.

Figure 1. Lifting the Gold Retainers from a Cable Connector. (Side View)

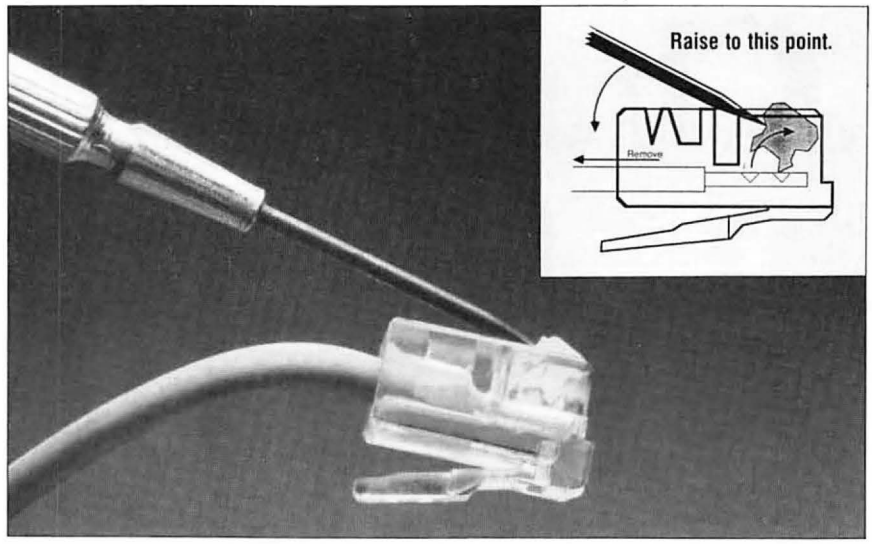
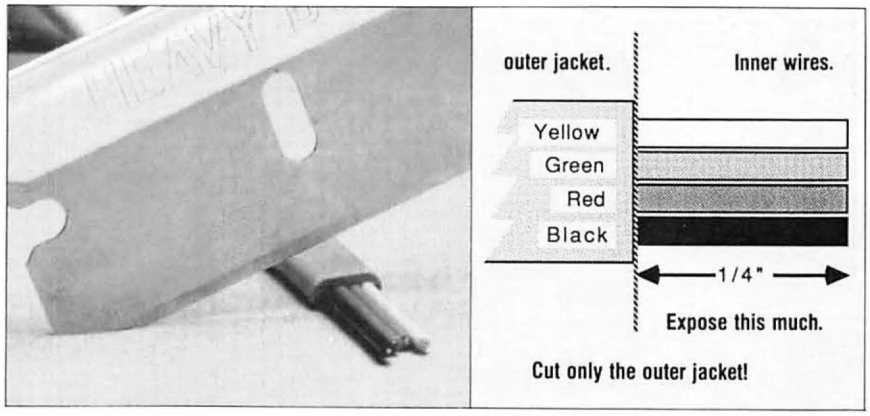


Figure 2. Preparing the Cable End.



THE KEY IS THE KEY

If you do have a one-key problem, determine its severity. Let's pretend your X key is skipping now and then. Set up your Mac and open a new document with any word-processing program. Alternately press the faulty X key and the - (or you can use any other character), watching the screen as you type. With a good X key you should see a perfectly alternating string of characters: X-X-X-X-X-. If the key is working intermittently, you'll see an irregular pattern: X-X-X-X-X-X-X-X. If the X is totally gone, you'll see ----.

OK, your key is totally on the fritz, and maybe two marginal keys are waiting to take revenge. What now? Your alternatives range in cost from a few cents and a few minutes to a full-blown service-plus-parts expense, plus waiting time. The more desperate,

Figure 3. Installing a Connector. (End View)

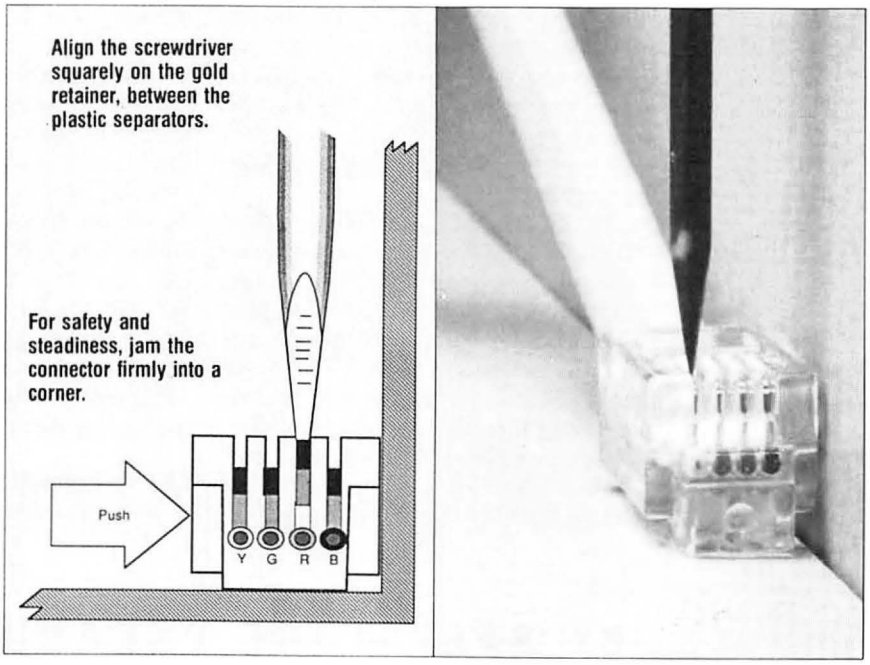


Figure 4. Installing a Connector. (Side View)

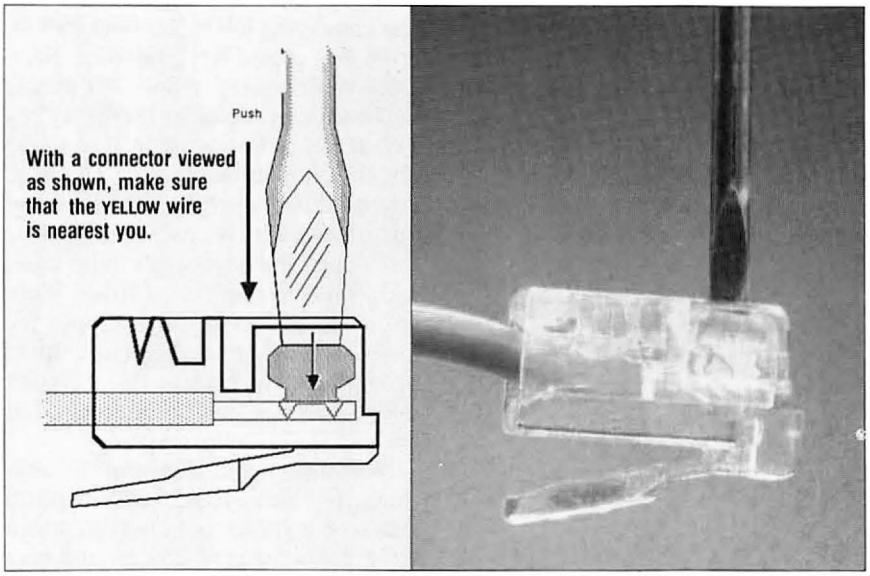


Figure 5. Pinching the tabs to release the key switch. (Top View)

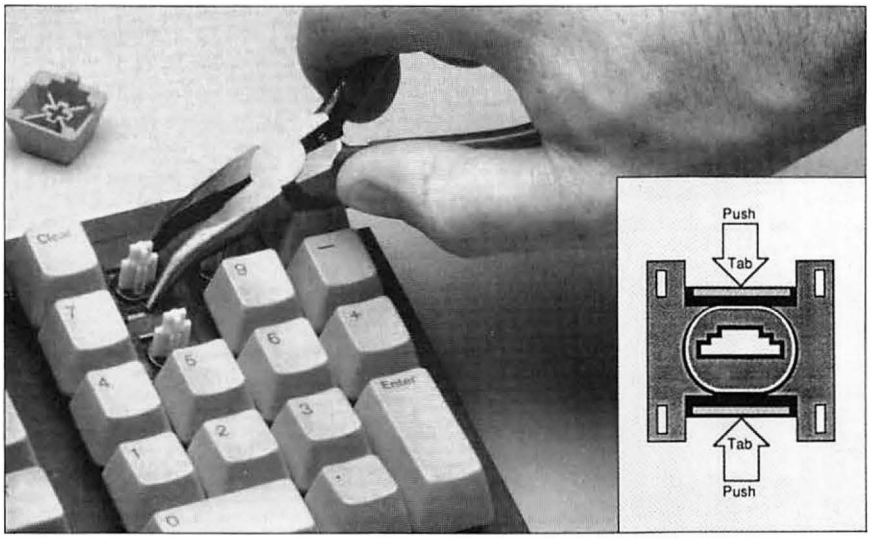
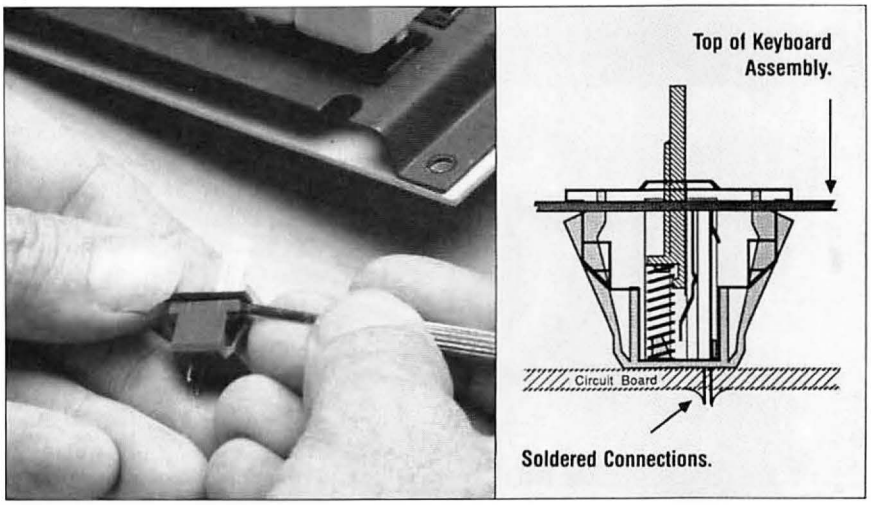


Figure 6. Assembled Key Switch.



technical, and adventurous you are, the less it will cost you and the sooner you can resume working. But before you open the keyboard, you may want to try some less drastic remedies.

YOUR FOUR OPTIONS

• Buy a new keyboard. This is a drastic and expensive solution, but it can be worth your while if you have several buggy keys or if you bought a Mac Plus upgrade and kept your old keyboard. This should be a fairly quick fix if you can afford it and you can find an Apple dealer open who has a keyboard in stock. Your dealer can exchange the inner workings of your keyboard, using your old case, for about $130. For about $140, you can get a new keyboard, including the cable and no trade-in. Shop around.

• Have your keyboard professionally serviced. This also requires no work on your part, and you'll have a guaranteed fix. You may, however, spend time looking for an Apple dealer, and you'll need to wait for your working keyboard. For replacing a single key, one local dealer charges $30 and returns it in one day. Another charges $21 and, if luck is with you, will do the job while you wait. Replacing a few more keys costs $10 per key. For five or more replaced keys, you'll pay for additional labor time.

• Find a technically minded person who's willing to do the deed as a favor for the cost of parts and/or a reasonable fee. You'll get no guarantees and you may still have to wait, but on the other hand, you may get off for the price of a lunch. Of course, there's also a risk factor, but you can minimize that with biographical research. If you do find that person, he or she should read this article.

• Spritz the fritz: This method is chancy at best, and it doesn't guarantee a permanent fix. But you can do it yourself (regardless of your level of skill), and it requires only paper clips, spray-type electronic-contact cleaner, and some hope. You do this with the Mac still on and the keyboard attached. You'll need to remove the key cap (the part you touch with your finger) from the bad key to expose the stem (the part that slides up and

down). Use a hook-shaped paper clip on each side of the key cap. Pull up gently and evenly. Go straight up or you may break the key stem. Spray the contact cleaner around the stem as you depress and release it, as described in the key test. Watch the screen for improvements. If you try this solution first and there is no improvement, you can try one of the other options, or you can roll up your sleeves, take a deep breath, and press on.

HAVE A BOARD MEETING

Here you attack the problem firsthand. If you can use a soldering iron, you can do the job in less than half an hour. My record is 12 minutes. Basically, you're going to open the plastic keyboard case, desolder the faulty key switch, replace it or clean it, reinsert the switch, and resolder it. The Mac keyboard is rugged. Be confident, and don't feel you're disarming a bomb.

To open the keyboard's outer case, use a small Phillips screwdriver. Work on a nonconductive surface with the keyboard unplugged. Don't attempt to open the *inner* case at all. It won't budge, and you don't need to get that far.

Whenever you disassemble anything, put screws and small parts in stable or sealable containers such as a cups, bowls, or plastic bags, and take care not to spill these. Work where you can easily find dropped parts, such as over a large bowl or a white cloth. A shag rug can ruin your day. If you have any doubts about reassembly, make careful notes about what goes where, put related parts together, and label their containers. The figures with this article should help you through.

You'll need needle-nose pliers, a small pencil-tip soldering iron or gun, a few inches of rosin core solder, and a length of *desoldering braid.* You use the braid to suck up existing solder thoroughly from a joint. Go to a local Radio Shack or similar outfit, and the staff'll set you up. There are other ways to suck solder, but the braid is best.

AN I FOR AN I

Unlike their individually lettered caps, all key switches for your 128K/512K and Plus are the same. This simplifies things for everyone.

If you can, purchase a replacement key switch from an Apple dealer's service department. It'll cost about $10. Go home. If a dealer is inaccessible, read on; you'll have to do this anyway.

Heat up your soldering iron. Open the keyboard case, and remove the letter cap from the faulty key switch. Each key has two contact points, which are soldered to the bottom circuit board. Locate the two contact points directly below the faulty key switch. The contact points are numbered. Remember the number of your

Figure 7. Upper Key Switch Housing.

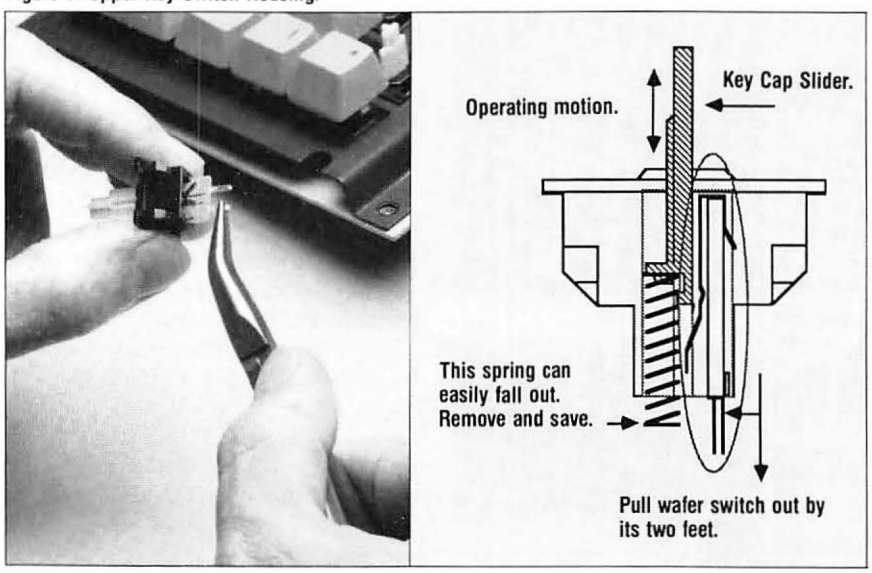


Figure 8. Lower Key Switch Housing.

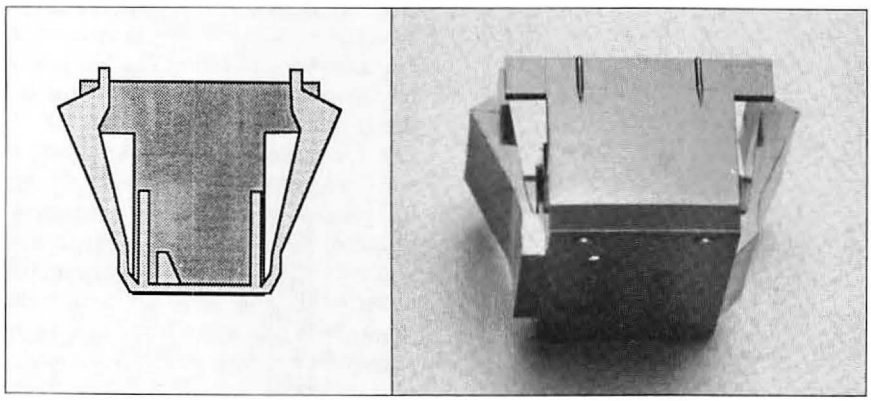
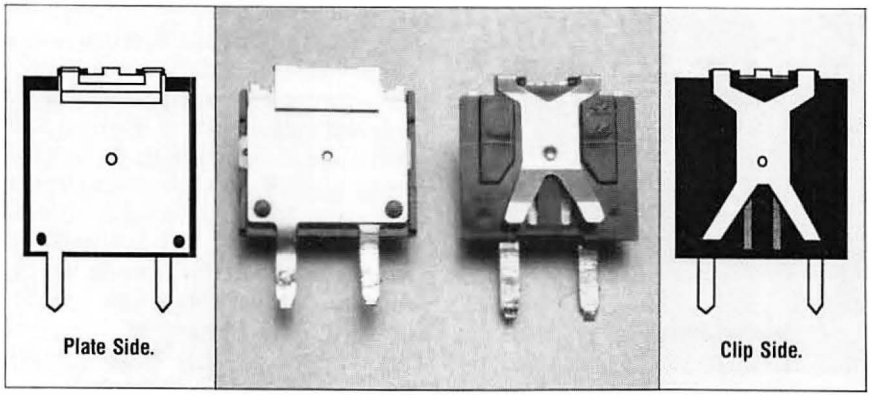


Figure 9. Wafer Switch Faces.



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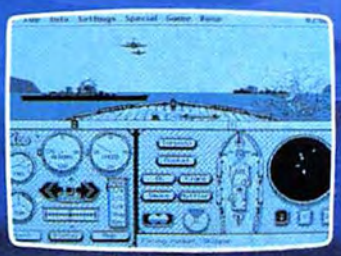
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Figure 10. Opening the Wafer Switch (Edge View).

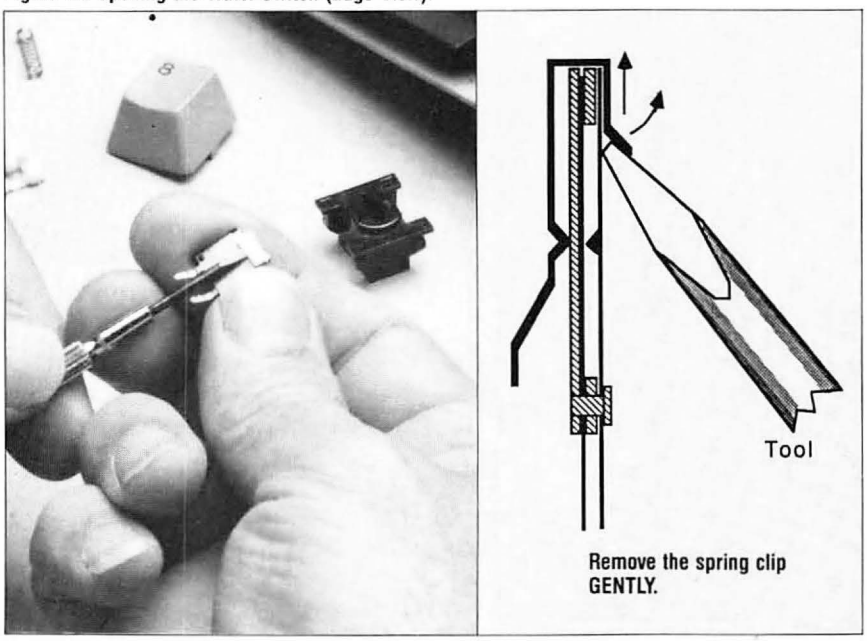


Figure 11. Entering the Wafer Switch (Edge View)

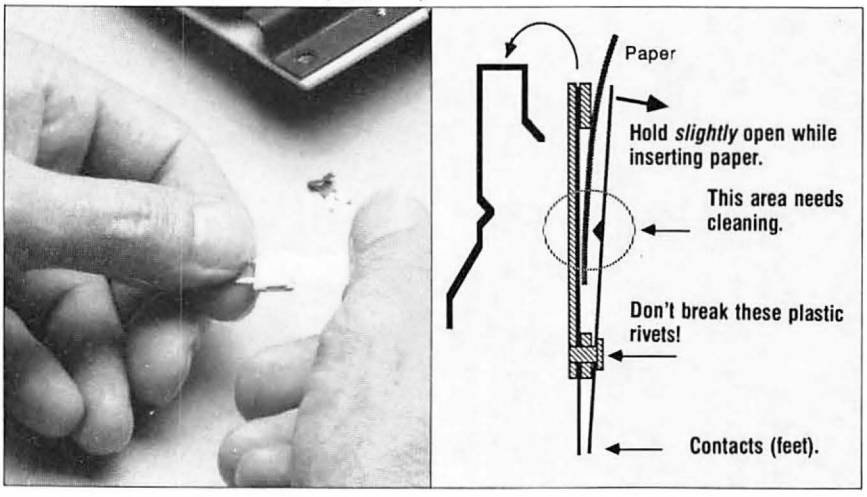
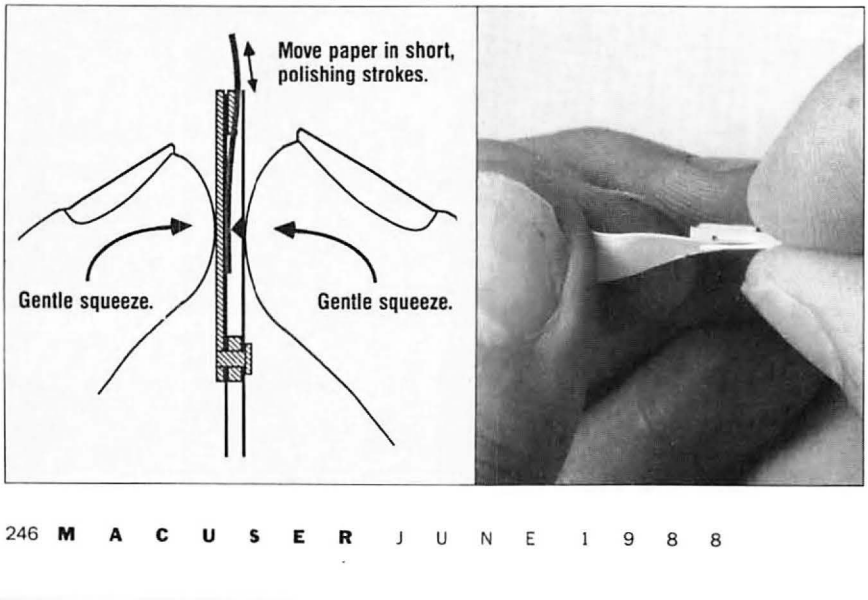


Figure 12. Cleaning the Wafer Switch (Edge View)



bad key to avoid having to discover its location by eyeball each time. *Triple-check this finding.*

PULLING THE OLD SWITCHEROO

Removing a key switch involves two steps: First, desolder it from the circuit board; then, unlock it from the upper plate and lift it out. If you find it difficult to work in cramped quarters, you can make room by removing the caps from keys around the bad one. Remember the arrangement of the keys on your board.

To desolder, while working on the bottom of your keyboard assembly, touch one of the contacts of the faulty key switch with the desoldering braid and heat *the braid* with your iron until the solder melts and flows into it. Keep the braid hot as you sweep it around the contact. Repeat this with the second contact using fresh braid. Pick up all the solder. When the contacts *look* free, wiggle them in their holes to make sure.

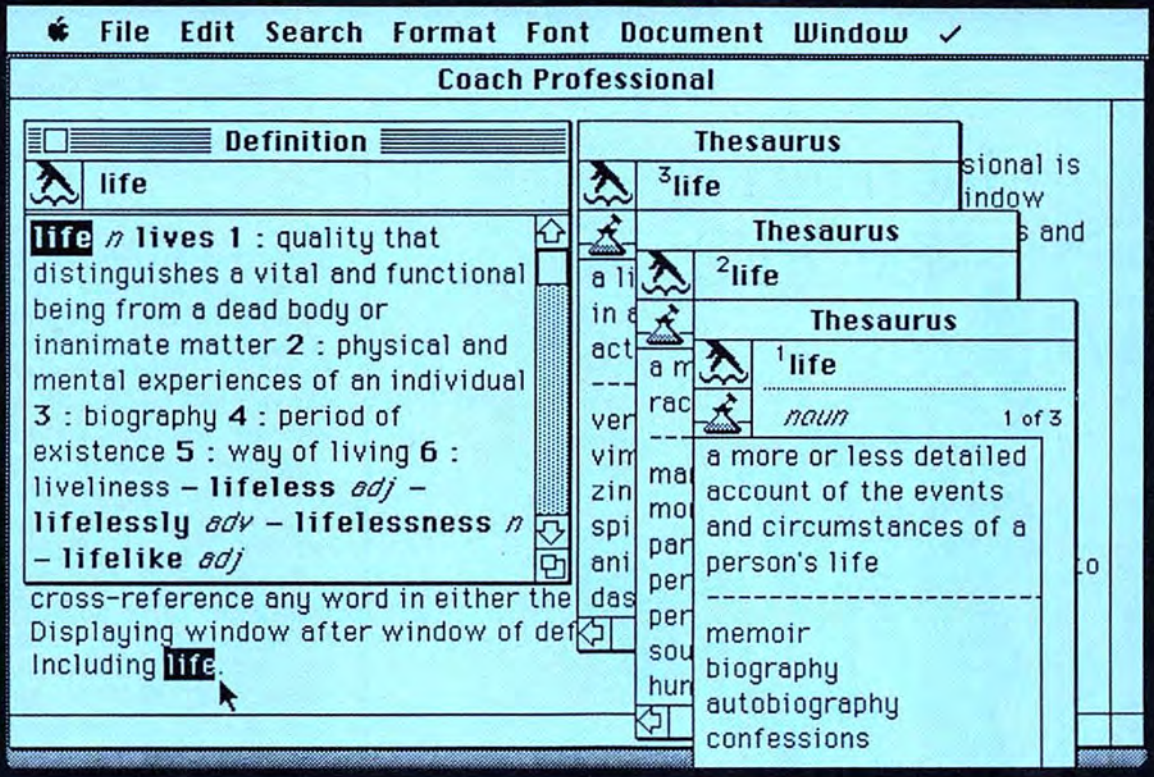
Now, working on the top side of your keyboard, use your needle-nose pliers to pinch together the movable tabs of the key-switch case (see Figure 5). You should begin to see some motion. Keep the flaps pinched as you push up lightly on the desoldered contacts or pull up on the key stem to coax the switch assembly up and out of its hole.

IF YOU HAVE A NEW SWITCH

Put the bad switch aside, and insert the new key switch. Line up its contacts with their holes on the circuit board. You'll feel and hear a firm click when the switch is in place. Flip back to the circuit-board side, and apply just enough solder to make a good connection.

Connect and test your keyboard before closing the outer case to make sure you've fixed the right key and that the problem has truly gone. Don't trash the old switch! Clean it as described later, and keep it for the inevitable next time.

If you can't get a replacement key switch, you'll need to enter the inner sanctum of your once-faithful clicker. Figures 6, 7, 8, and 9 should help you to identify the key-switch components.



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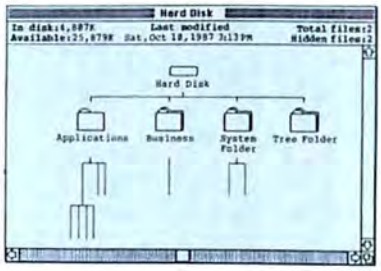
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Really, once the switch is in your hand, it's less awesome and less complex than the X-ray views might suggest.

Use your common sense and a thin blade to pry apart the interlocking T tabs that hold together the upper and lower switch sections. This will expose three small components: a spring, a slider (key stem), and the culprit switch whose feet you desoldered from the circuit board (see Figure 9).

Remove the silver-metal forked retainer from the top of the wafer, and follow the directions in the illustrations, without forcing open the wafer switch more than it takes to slip in a sheet of good paper or paper money. Wiggle the paper while gently squeezing the wafer to provide a light polishing action inside the mechanism (see Figures 10, 11, and 12). You can test the switch with an ohmmeter by clipping the test leads to the wafer switch contacts and manually squeezing the wafer. In the absence of a meter, you must reinstall the switch and hope for the best. If tests show that there's still no contact, repeat the cleaning process using extremely fine sandpaper and *very* light pressure. Follow the sandpaper treatment with plain paper. That's it. Now carefully reattach the forked retainer to reseal the wafer.

With the upper (black) switch housing upside down, reinsert the slider. Then insert the assembled wafer switch. It's a smooth, but snug fit. Add the coil spring, and finally, snap the lower switch housing back in place, making sure the wafer switch feet are lined up with their exit holes in the lower housing.

Follow the key-switch reinstallation procedure described above, and you've finished. Now you can boldly trek to Timbuktu with your Mac and be assured that you can repair a cable or unglitch a key with common implements and no new parts. You've become (dare I say it?) the chairman of the board.

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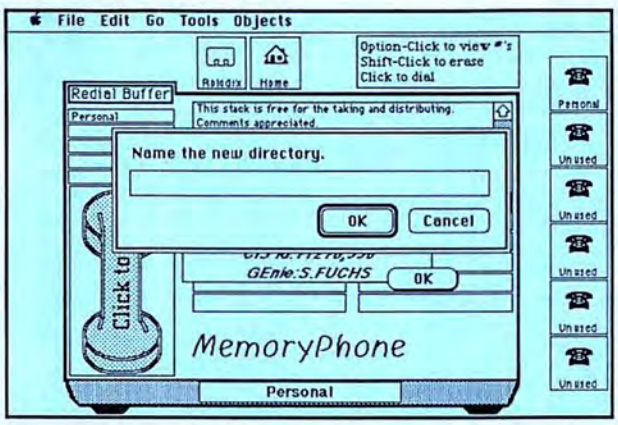
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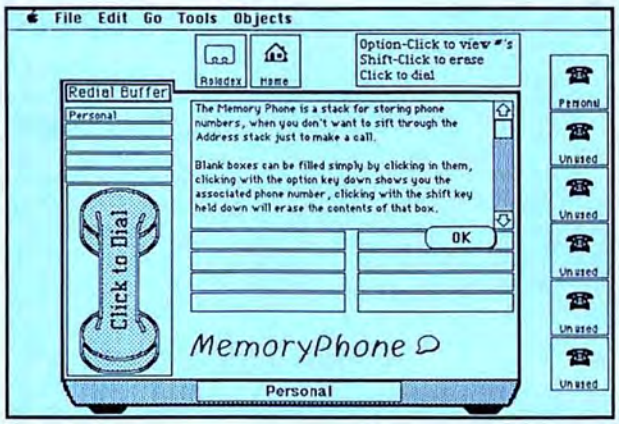
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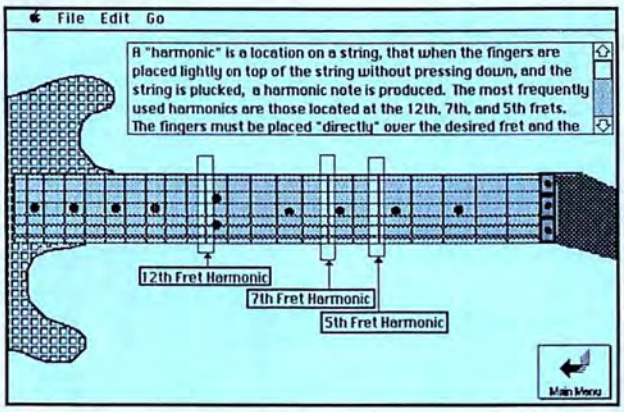
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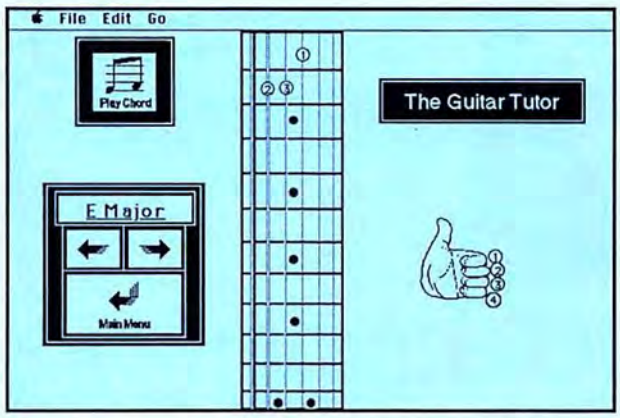




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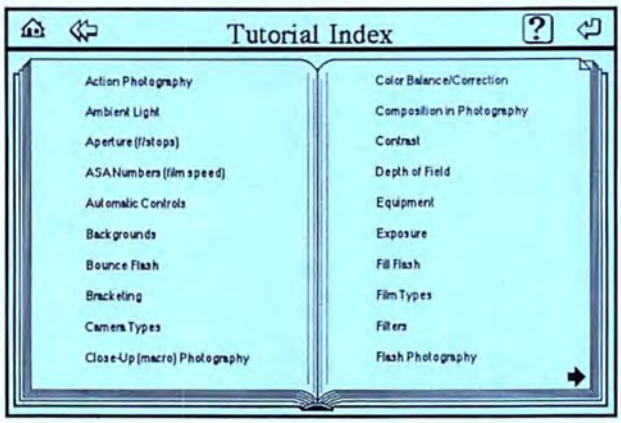


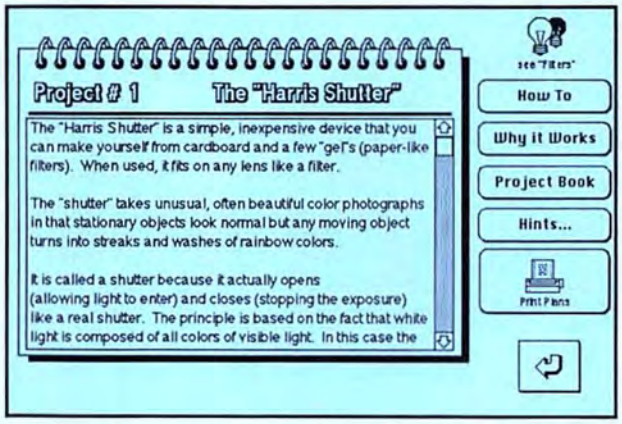
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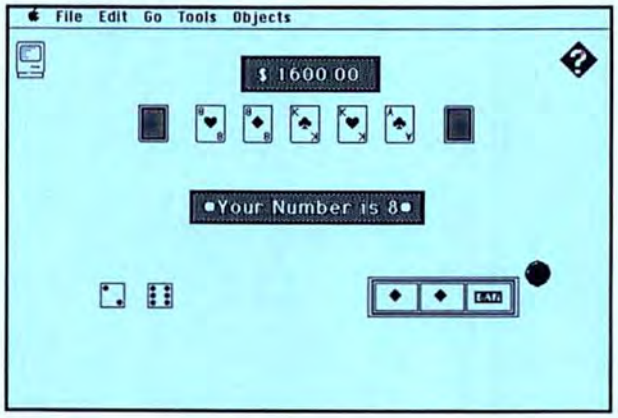
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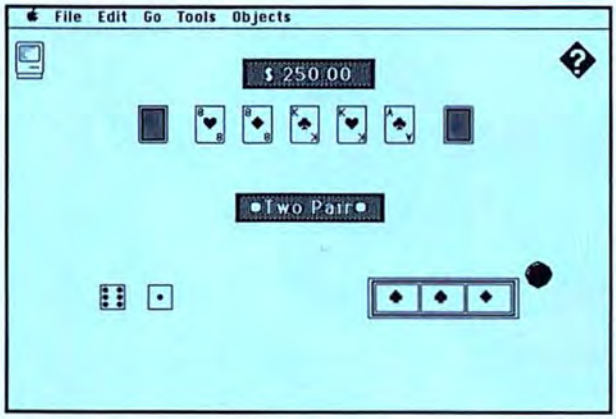




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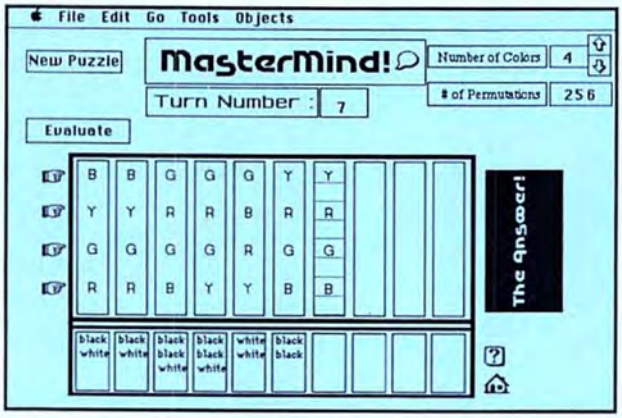
Life's a Gamble

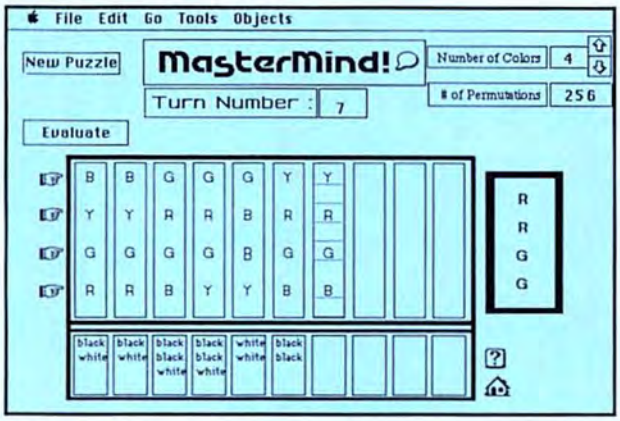




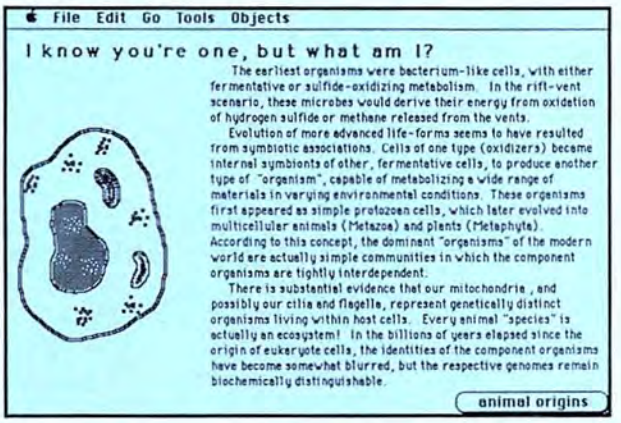
Play draw poker, dice, or slots with the *Gambler*. Las Vegas it ain't, but it can be fun. This stack comes from Bill Leslie, Infinity Microsystems, 959 Marina Blvd., Mandeville, LA 70448.

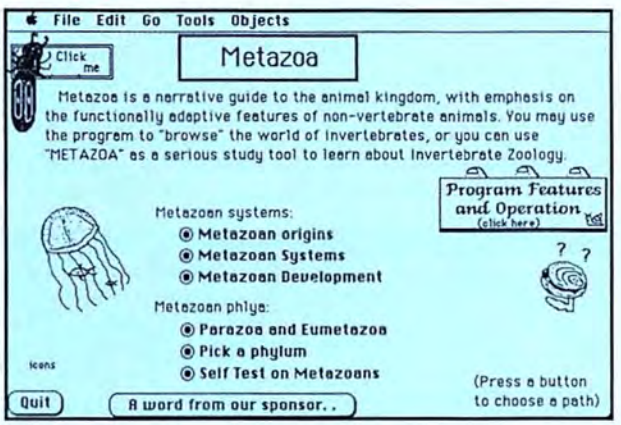
Color Coded

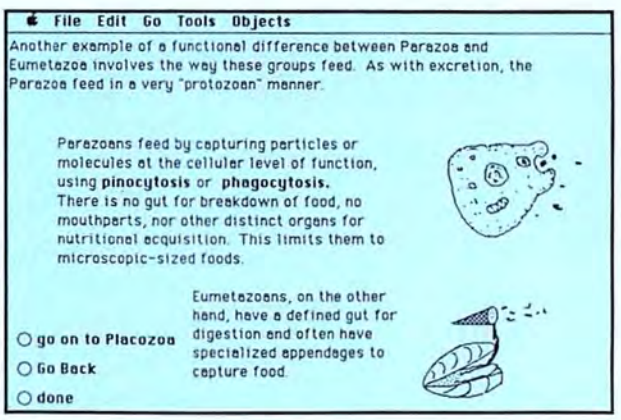




You get ten chances to solve this color coded puzzle. The higher level you choose, the more colors involved and the more challenging the game. *Mastermind* from Steven Fuchs, P.O. Box 129, Coram, NY 11727, CompuServe: 71270,550 or GEnie: S.Fuchs.







Metazoa, parazoa, eumetazoa! Need a refresher course in zoology or a study aid? This stack is a lesson in invertebrate zoology. It has information on the Metazoan systems such as nervous, circulatory, and muscular. Gives Metazoan phyla and includes a self test. *Metazoa* from Kerry B. Clark, Florida Institute of Technology, 150 W. University Blvd., Melbourne, FL 32901.

America the Beautiful







United States statistics at a glance. This stack gives charts of size, population, world position, and a list of interesting facts (lowest point in the U.S. is Death Valley at -280 ft.). Includes a card for each state listing pertinent information. *U.S.A. Facts* is shareware from Thomas Hughes, 1030 Atherton Lane, Woodstock, GA 30188.

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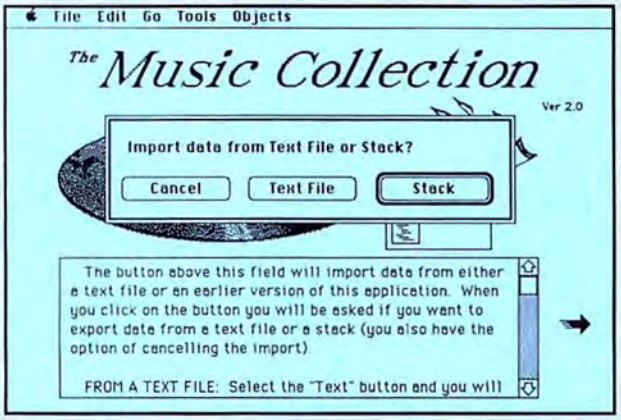
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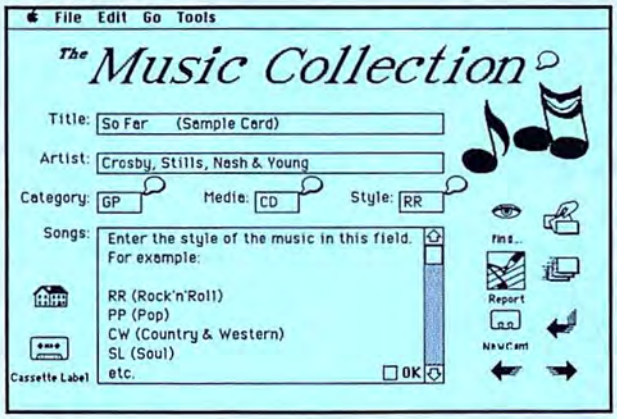
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Platter Matter

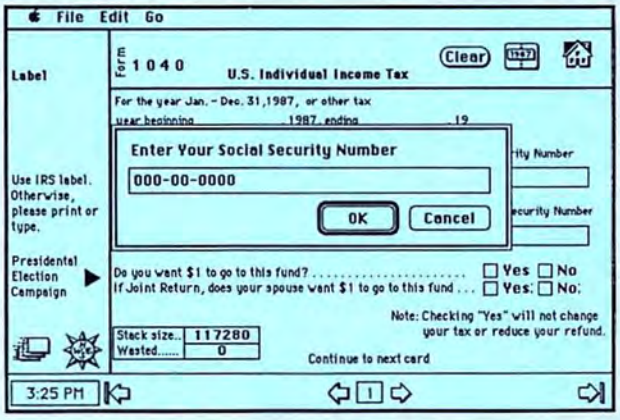
Keep track of your music collection by title, artist, artist category, media type, style, and song, and print your labels. When you exit, the stack compacts automatically. *The Music Collection* by David Fattahian, 16 Bullard Avenue, Fort Leavenworth, KS 66027, GEnie: D.Fattahian.

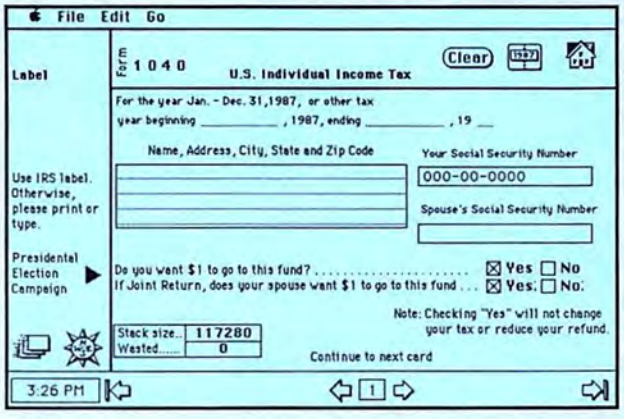




A Taxing Situation

Do your taxes on your Mac with these blank 1040 and 1040A forms. The stack doesn't have any tax instructions or tips on how to evade the IRS, but it does calculations. Aspirin not included. *Form 1040* from D. Powers, 930 Partridge Lane, Winston-Salem, NC 27106 or GEnie: D.Powers2.





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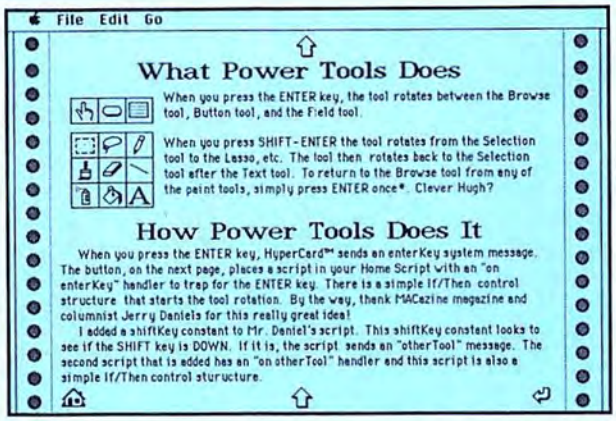
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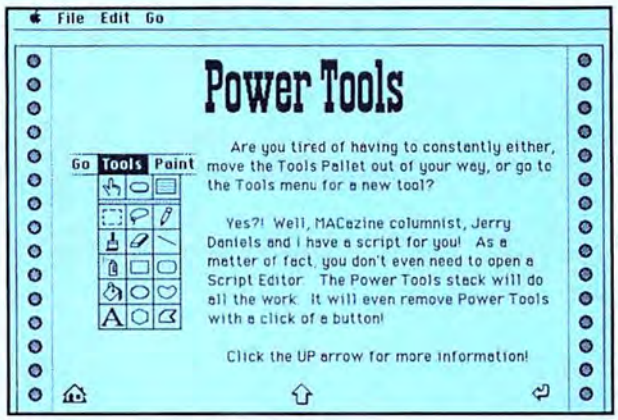
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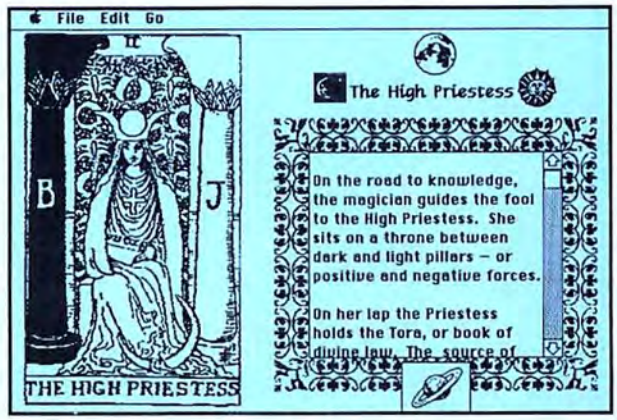
Your tool palette is gone, but the power is still there. Use keyboard commands to select the tools you need and free up your screen work space. *Power Tools* from Jerry Daniels and Mark Spaulding, GEnie: M.Spaulding.

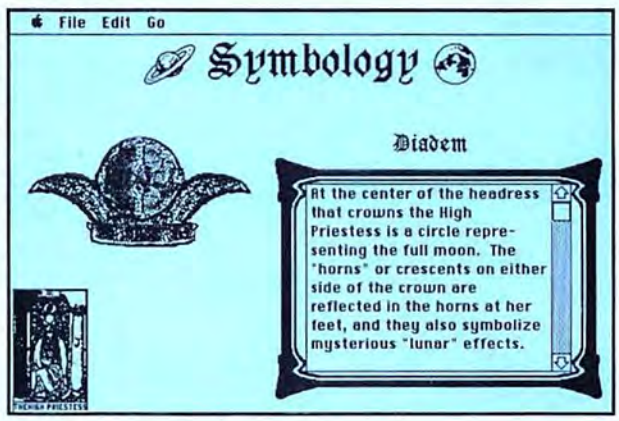




It's All in the Cards

This stack includes an illustration and interpretation of the 22 cards of Major Arcana or "Great Mysteries" of the Tarot. Each card in the stack gives a description of the card pictured, its meaning, and its reversed meaning. Buttons on the cards take you to interpretations of the symbols. Watch for a Minor Arcana stack. *Major Arcana of the Ancient Tarot Cards* from Susan Lewis, P.O. Box 10529 Calder Square, State College, PA 16805.





Command.

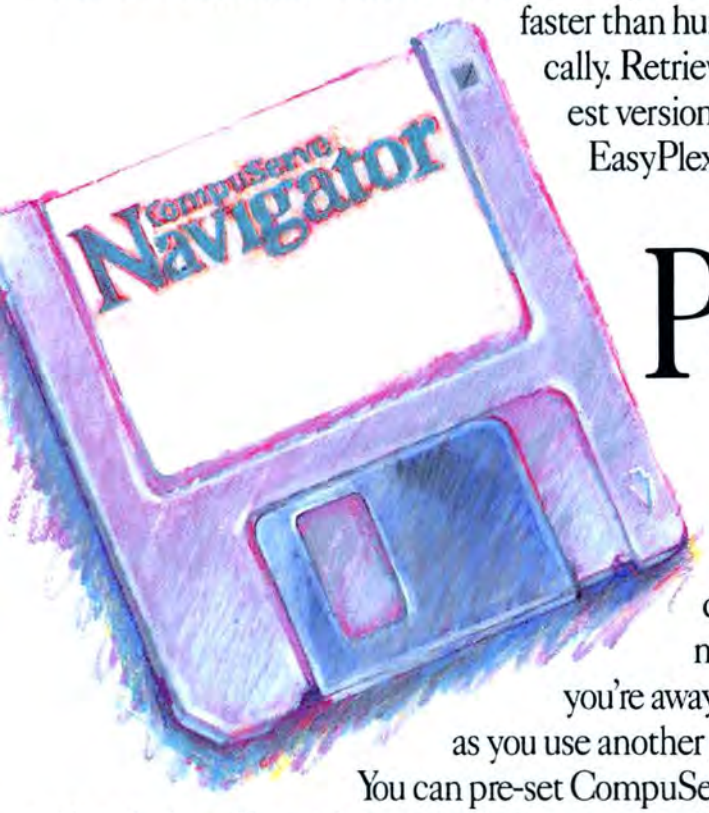
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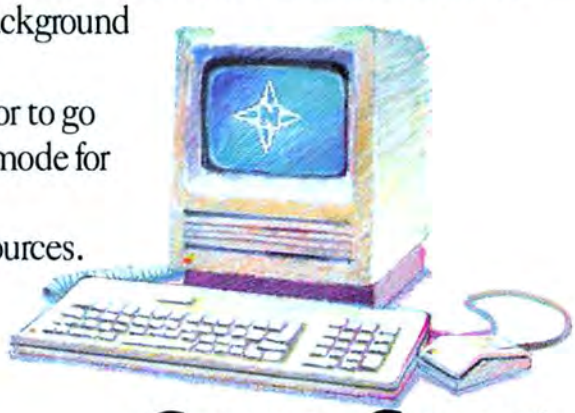
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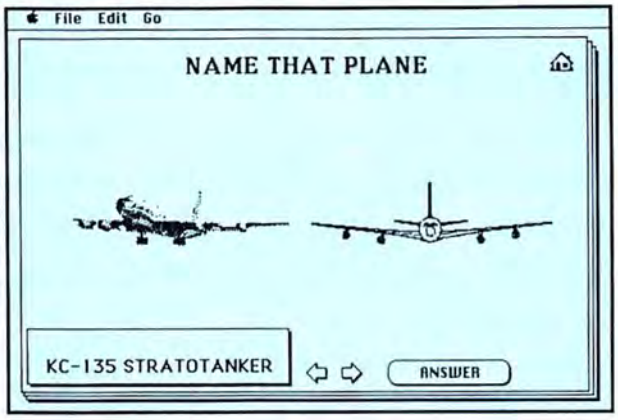
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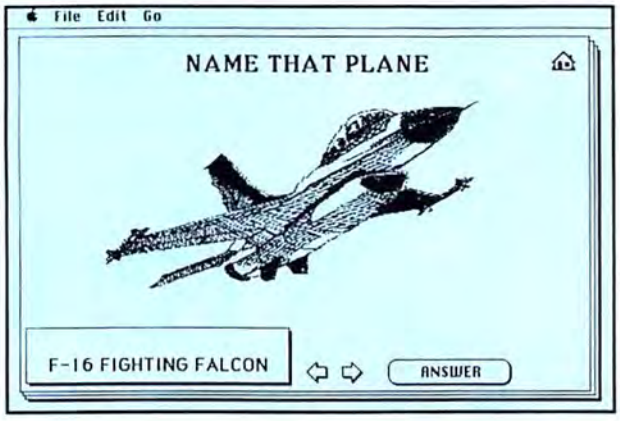
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Birds of Prey

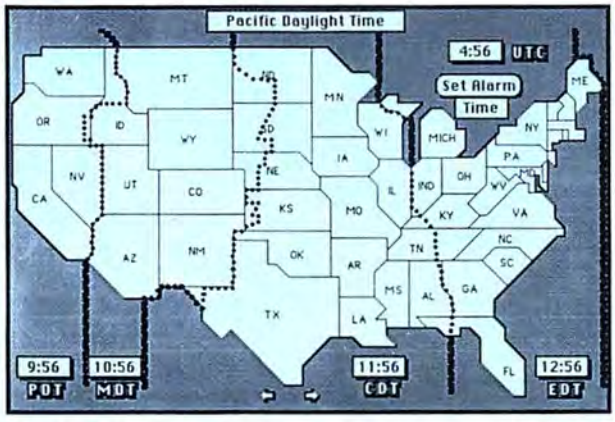
Birds of a feather are stacked together in this aircraft recognition stack that includes 18 cards. *Name That Plane* is freeware from Richard J. Wald, GEnie: R.Wald.

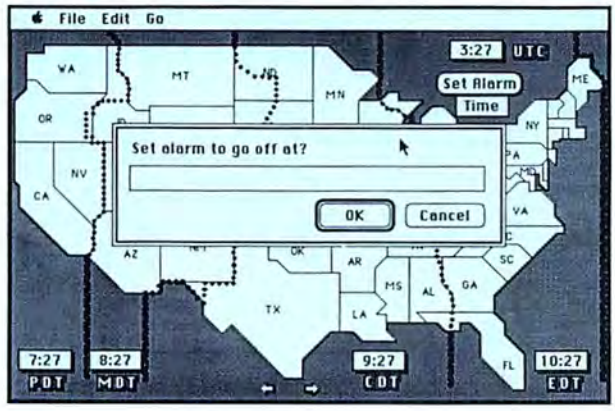




Night and Day

Set your Mac clock to 24-hour time and use the Coordinated Universal Time function on this *Time Zone* stack. Includes cards for standard and daylight time in all U.S. time zones. It also has an alarm button. This stack comes from Jim Frimmel of Willow Park, TX.





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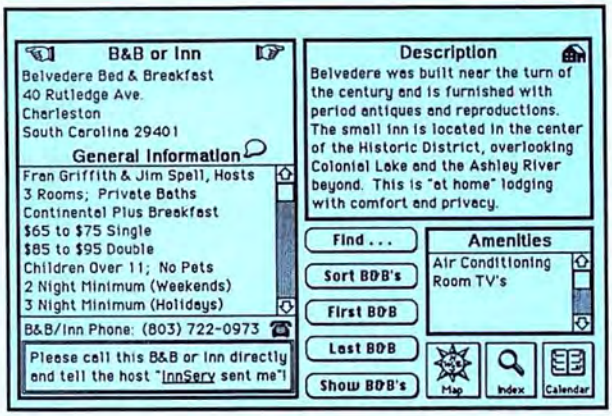
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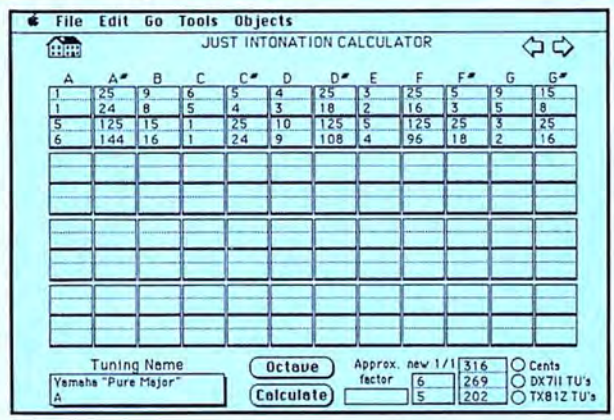
What's in in inns. InnServ, which represents over 600 of America's finest bed-and-breakfast and country inns, has gone *HyperCard*. General information includes hosts' names, accommodations, and prices, with a description of the facility and nearby attractions. *B&B HyperGuide* from InnServ, Route #1, Box 47, Redkey, IN 47373.

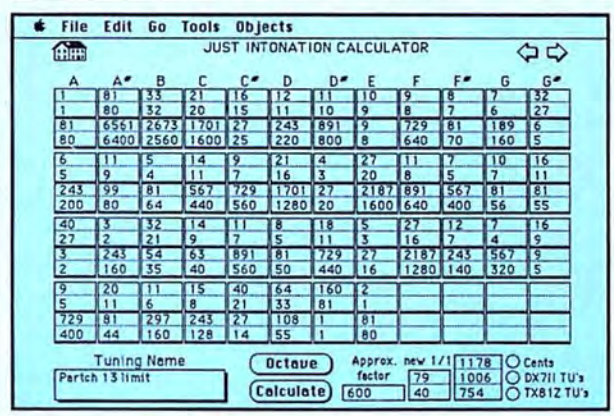




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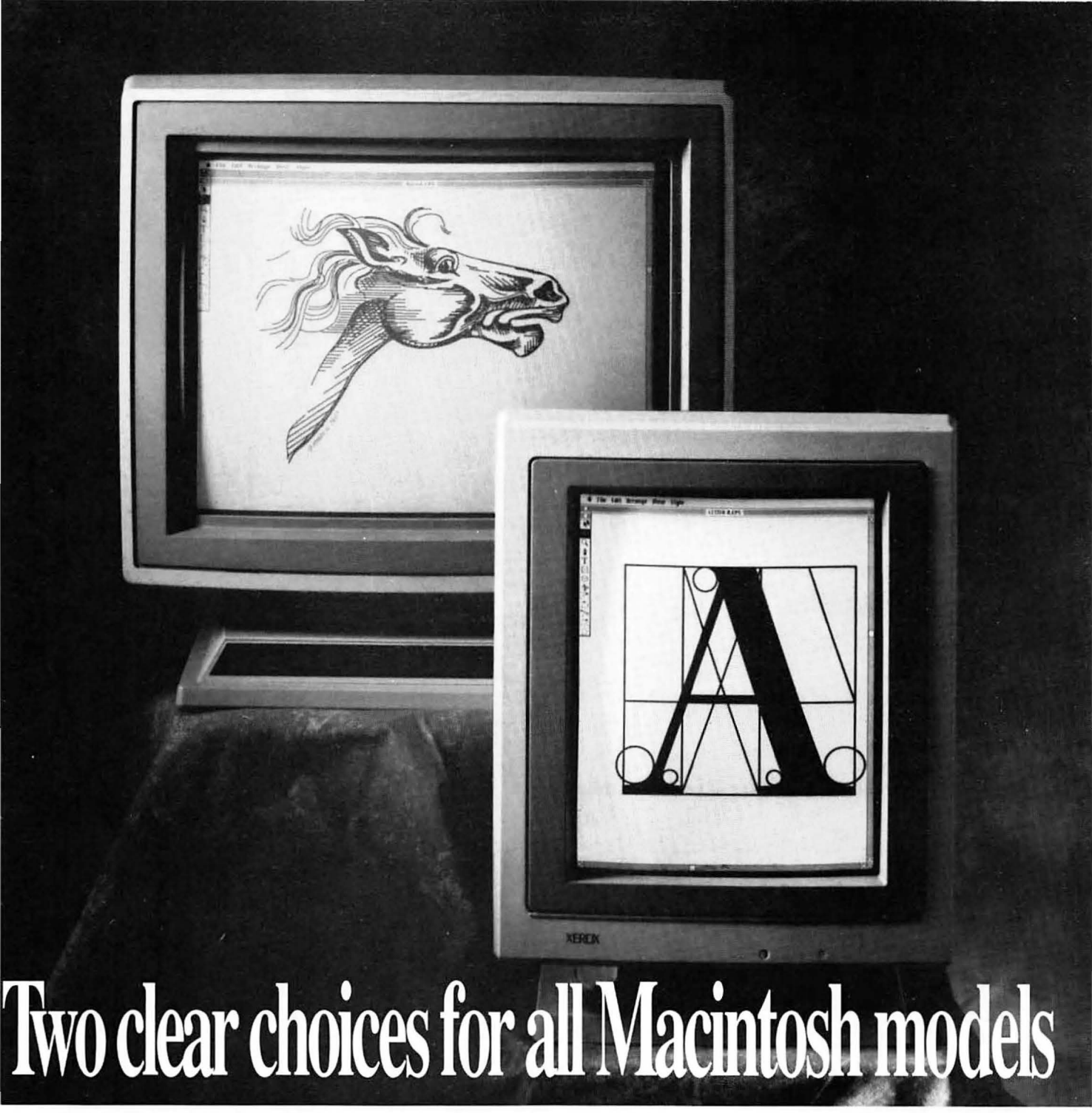
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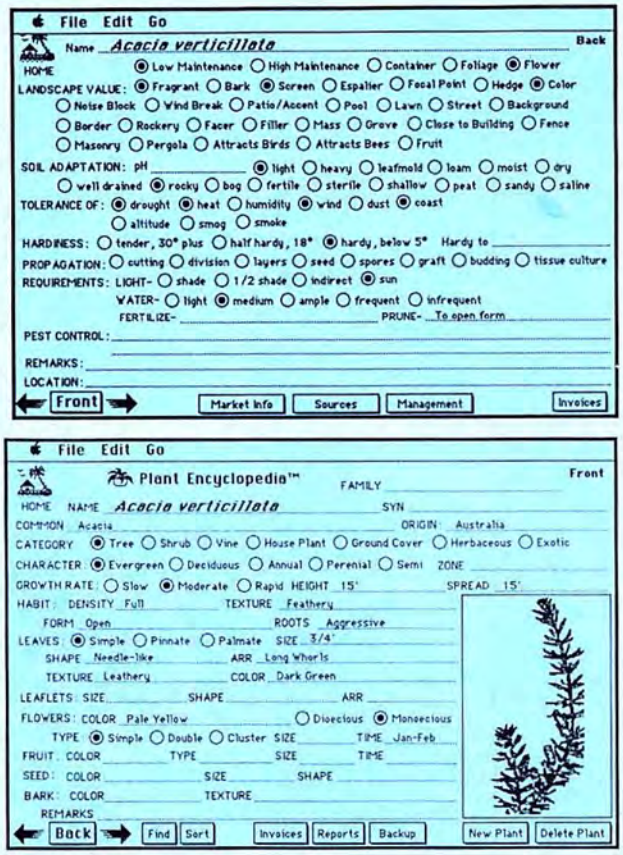
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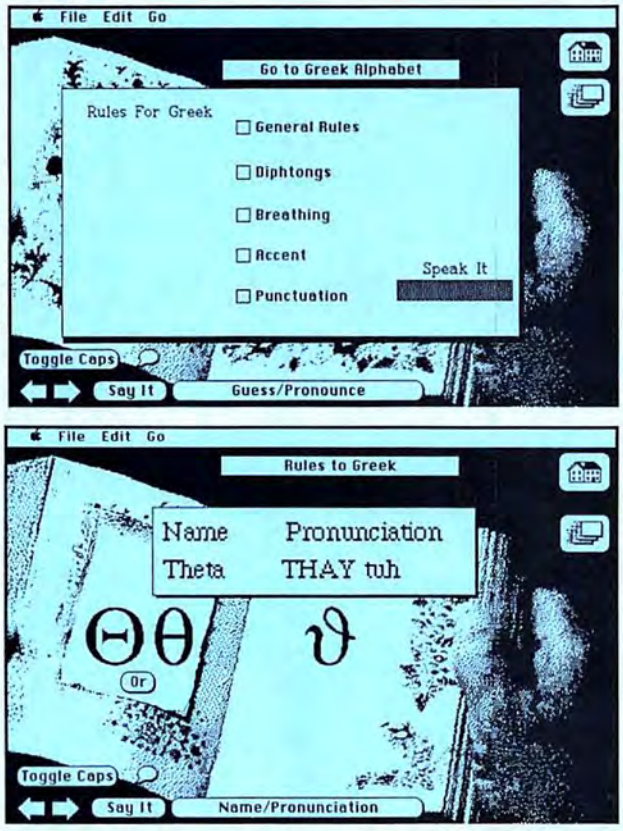
Green Thumb

This preview of *Plant Encyclopedia* promises information on over 900 species of plants that will grow in the southwestern United States. It includes common and scientific names of plants, classifications, growing conditions, and so on. Search for suitable plant materials by entering growing conditions. This stack is designed for the landscape industry, but versions for home use and universities are also planned. From Roland Burt, MacSolutions, 241 12th Street, Del Mar, CA 92014.



Alpha, Beta, Gamma

Now I know my ABC's — in Greek. Learn or review the Greek alphabet, pronunciation, and rules with this simple and basic tutorial. *The Greek Stack* is shareware from Douglas Wade, Servant Graphics Services, P.O. Box 4067, Redondo Beach, CA 90278.





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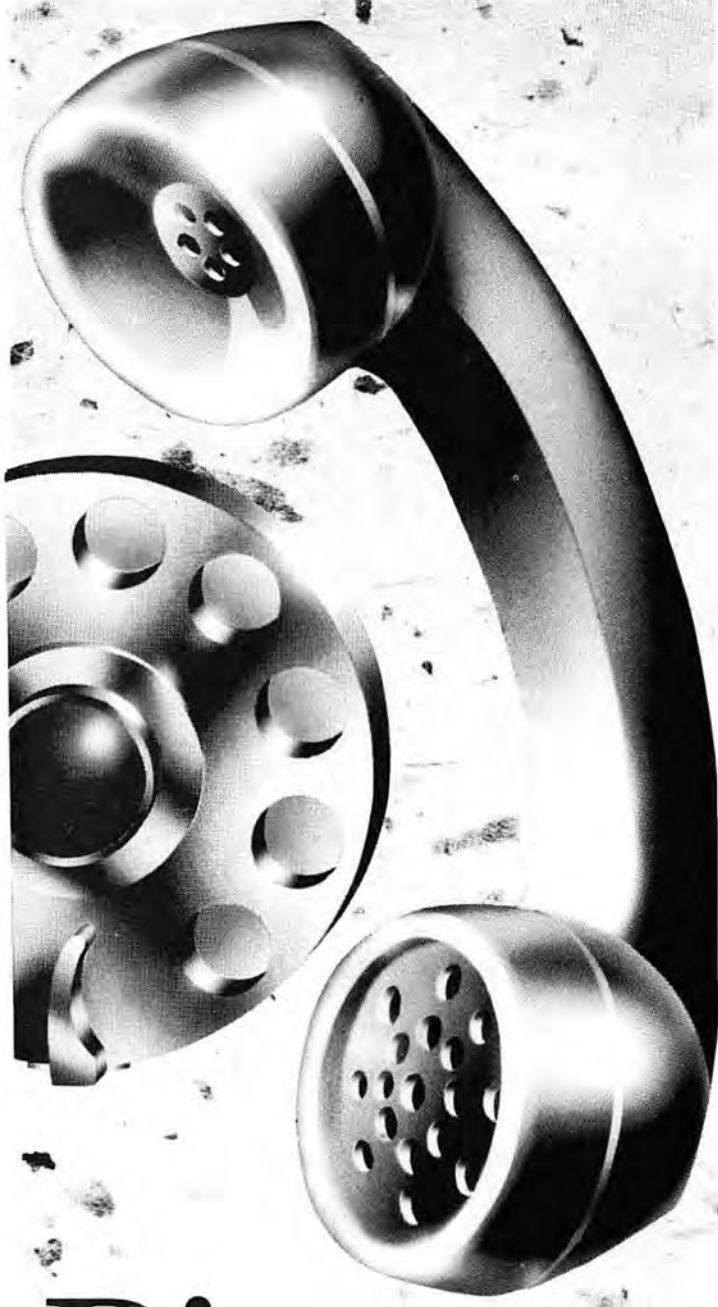
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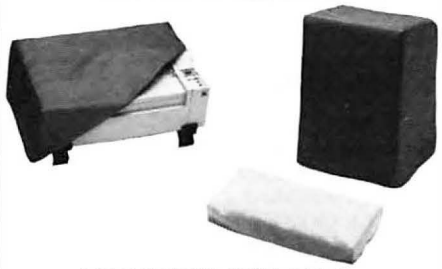
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MINIFINDERS



Have you often wished for a personal assistant to help in picking software? These MiniFinders may not breathe and move, but they do tell you what products are hot and, better, what these products do. Each of these items has been carefully reviewed and selected by the *MacUser* editorial staff. Each has been rated in increments of half mice, from 1 to 5. Ratings are relative within categories, and they can change as categories expand and new products advance the state of the art. You won't see many low ratings or bombs, since we're telling you about the cream of the crop, but we will warn you about the really bad products so that you don't spend your money on them. Red names indicate this month's additions. The letters at the end of the entries indicate whether a product is copy protected (CP) or not (NCP). If a product has been reviewed or Quick Clicked in *MacUser*, the date of the review is shown. Next time you have to find products you can count on, count on *MacUser*!

MINIFINDER INDEX

BUSINESS ACCOUNTING 266
COMMUNICATIONS 272
DATABASES 267
DESK MANAGERS 277
DESKTOP PUBLISHING 272
EDUCATION 285
ENTERTAINMENT 286
GRAPHICS & DESIGN 268
HARDWARE & ACCESSORIES 291
HYPERCARD 275
INTEGRATED SOFTWARE 266
LANGUAGES 284
MUSIC 290
NUMBER CRUNCHING 267
ORGANIZATIONAL TOOLS 275
PERSONAL FINANCE 266
SYSTEM SOFTWARE 275
UTILITIES 277
WORD PROCESSORS 274

BUSINESS ACCOUNTING

Accountant, Inc. V2.0 integrates accounts payable, accounts receivable, general ledger, and inventory modules. Prints checks, purchase orders, invoices, customized reports. Bare bones accounting system limited in size and scope, but ease of use and integration make it suitable for small businesses. Requires 512K+. $299. SoftSync, 162 Madison Ave., New York, NY 10016. NCP (Oct 87)

Back to Basics Accounting is a powerful double-entry accounting software package for the small business user with GL, AR, and AP modules. Exhaustive manual with numerous examples. Report capabilities are excellent. $199. Peachtree, 4355 Shackleford Rd., Norcross, GA 30093. NCP (May 87)

BPI General Accounting is an easy-to-use system. Six journals, AR, AP, Payroll, and GL on one disk. Offset amounts automatically post to ledgers. Up to 8000 accounts. Detailed records, wide range of reports. *Switcher* and HFS compatible. $249. Requires 512K+. BPI Systems, 3001 Bee Cave Rd., Austin, TX 78746. NCP (Aug 86)

CheckMark is a Ledger with five preset journals: Cash Disbursements, Receipts, General, Sales, and Purchases. Menus and data entry are very straightforward. Flexible summary reports are built in; customer and vendor info is very minimal. $395. CheckMark Software, PO Box 860, Fort Collins, CO 80522. NCP (Dec 85)

Insight is a high-powered accounting program for the small-to-medium-sized business. Modules include Accounts Receivable, Payables, and General Ledger; others are in the works. Requires 512K and hard disk. $595. Layered, 529 Main St., Boston, MA 02129. NCP (Dec 86)

Rags to Riches integrated accounting modules (General Ledger and Accounts Receivable) uses Mac interface to the hilt. Information entered in one window automatically transfers. Detailed, flexible report options. Very easy to use, but it can be confusing with several windows on screen. Requires 512K+ and printer. $199.95 per module. Chang Labs, 5300 Stevens Creek Blvd., San Jose, CA 95129. NCP (Dec 85)

Rags to Riches Professional Billing tracks and bills professional services. Batches activities for individual timekeepers. Use as standalone, or integrate with *R to R* modules. Requires 512K+, printer. $399.95. Chang Labs, 5300 Stevens Creek Blvd., San Jose, CA 95129. NCP (Feb 87)

Strictly Business General Ledger features clear, well-outlined setup procedures and operations. Very flexible, up to 99 profit centers with up to 100 departments each, and customized reports. Program print spools. Requires 512K+, printer and external drive. $395. Future Design, 13681 Williamette Dr., Westminster, CA 92683. NCP (Dec 85)

INTEGRATED SOFTWARE

Jazz provides well-integrated modules for word processing, graphs, worksheets, databases, and communications. HotView is best feature. Requires 512K+ and external drive. Version 1A requires 400K drive. $395. Lotus, 55 Cambridge Parkway, Cambridge, MA 02142. CP (Prem)

Microsoft Works is an integrated application that includes word processing, database, spreadsheet, and telecommunications functions. The telecommunications module includes both background up- and downloading. $295. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. NCP (Oct 86)

Trapeze (version 2.0) is a powerful presentation worksheet that combines mathematical functions and graphic representation. The interface, which consists of an icon bar, can be awkward to use. Mac II and color supported. $395. Access Technology, 555C Heritage Harbor, Monterey, CA 93940. NCP (Dec 87)

PERSONAL FINANCE

Dollars & Sense is a bookkeeping program. Easy to use, with a good manual and excellent on-screen help. Will handle up to 120 separate accounts or money categories. Uses standard double-entry accounting techniques. Will work on 128K. $149.95. Monogram, 8295 S. La Cienega Blvd., Inglewood, CA 90301. CP (Mar 87)

MacInTax is an excellent tool for preparing tax forms. Intuitive, easy to use. Accepts data from leading personal finance programs. Good built-in help. Liberal upgrade policy for current owners. California forms set also available. $119 federal; $65 California. SoftView, 4820 Adohr Lane, Suite F, Camarillo, CA 93010. NCP (Mar 87)

MacMoney is a complete and easy-to-use personal financial system. Intuitive data entry. Integrates with *MacInTax*. Requires 512K+. $74.95. Survivor Software, 11222 La Cienega Blvd., Inglewood, CA 90304. NCP (May 87)

MINIFINDERS



Market Pro is a comprehensive portfolio management program for ★★★★ the generation of fundamental data as well as technical charts and graphs. Requires 512K+, external drive, and Hayes-compatible modem. $395. Pro Plus Software, 2830 E. Brown Rd., Mesa, AZ 85203. NCP (Nov 86)

DATABASES

Business Filevision is a masterpiece of Macintosh programming, ★★★★ the only true graphic database on any micro. Much more powerful than the original, accepts *MacPaint* graphics. $395. Marvelin, 3420 Ocean Park Blvd., Santa Monica, CA 90405. NCP (Feb 86)

C.A.T. is a dedicated relational database for managing contacts, ★★★½ activities and time. Difficult to learn, but easy to use. Its rigid structure takes some getting used to, but links between types of data make it easy to keep track of important people and events. $299.95. Chang Laboratories, 5300 Stevens Creek Blvd., San Jose, CA 95129. NCP (Nov 87)

dBase Mac is a relational DBMS that includes a structured pro- ★★★★ gramming language to develop standalone applications. Palette icons as alternatives to menu commands will help novice users. Requires 1M+. $495. Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90502-1319. NCP (Feb 88)

Double Helix II is a powerful database that supports a multiuser ★★★★½ environment with an upgrade. Uses an icon-based development system for easy creation of databases. $595, single user version. Odesta, 4084 Commercial Blvd., Northbrook, Ill 60062. NCP (Apr 88)

File is a flexible data manager. Creates files for a variety of data, ★★★★ including simple graphics. Files are created in simple row/column format, but reports and forms are easily customized. $195. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. CP

FileMaker Plus retains features of *FileMaker* and reads *FileMaker* ★★★★★ data, also displays up to 8 files, uses "lookup" to retrieve data from other files. Enhanced calculation with many additional functions. Scripts automate a sequence of actions. Requires 512K+. $295. Nashoba Systems, 1157 Triton Dr., Foster City, CA 94404. NCP (Nov 86)

4th Dimension is a powerful relational database that creates ★★★★½ standalone applications. Features a Pascal-like programming language environment. Versatile design tools. $695. Acius, 20300 Stevens Creek Blvd., Cupertino, CA 95014. NCP (Nov 87)

MacDewey! (version 2.5) is a cataloging program featuring the ★★★ Dewey Decimal Classification system. Uses predefined fill-in-the-blank fields to create catalog cards. Suffers from bugs in search routines and the inability to distinguish first names. Not for professionals; home libraries might benefit. $79.95. Mousetrap Software, 336 Coleman Dr., Monroeville, PA 15146. NCP (Nov 87)

MacRelax is a relational list manager that stores data in a column ★★ format. Files can be related by sharing a common field. Flexible design for reports. Screen display is sometimes strange. Easy to use but not obvious to learn. $59.95. 1M+ required. Arrays, 6711 Valjean Ave., Van Nuys, CA 91406. NCP (Jan 87)

Omnis 3 is a power database, featuring concurrent multiple file ★★★★ management. Can handle 24 files, 12 at a time, and is fully relational. Create custom environments, including user-defined menus, commands, and dialogs. $495. Blyth, 2929 Campus Dr., San Mateo, CA 94403. NCP (Mar 86)

OverVUE is a power-packed relational database that has extensive ★★★★½ sorting, summarizing, and report generation capacity. Has macros, and a charting function. Good manual. It can exchange files with a very wide variety of other programs (including IBM software). $295. ProVUE, 222 22nd St., Huntington Beach, CA 92648. NCP (Nov 85)

Professional Bibliographic System is a specialized database for ★★★★ storing and retrieving bibliographies. Redesigned templates (20) simplify creation. Version 2.6 offers improved speed, flexible formatting. $295. Personal Bibliographic Software, Box 4250, Ann Arbor, MI 48106. CP (Feb 87)

Record Holder is a flexible, easy-to-use form-oriented data manag- ★★★★ er. Setup is particularly simple and the search features are powerful. $69.95. Software Discoveries, 137 Krawski Dr., South Windsor, CT 06074. NCP (Apr 86)

Reflex For The Mac is a flexible relational database. Excellent ★★★★½ report generator gives full control over appearance, style of output. Requires 512K+, second drive, or hard disk. $99.95. Borland International, 4585 Scotts Valley Dr., Scotts Valley, CA 95066. NCP (Dec 86)

Reflex Plus is a relational database with "smart" entry, and report ★★★★ design, but no overall programming facility. Simple to set up, yet fast. Graphic capabilities are quite limited. Version 1.0 reviewed. $279. Borland/Analytica, 4585 Scotts Valley Dr., Scotts Valley, CA 95066-9987. NCP (Feb 88)

Writer's Workshop maintains orderly records for writers. It can ★★★½ track manuscripts, income, and publisher. Based on and includes *Runtime Helix*. $99.95. Futuresoft System Designs, PO Box 132, New York, NY 10012. NCP (Apr 87)

NUMBER CRUNCHING

DesignScope is a construction kit for digital and analog circuits. Up ★★★★ to 254 components can be utilized in a single circuit, and the equivalent of a dual trace oscilloscope plots output in real-time. Good for testing circuitry without touching a breadboard. $249.95. BrainPower, 24009 Ventura Blvd., Calabasas, CA 91302. NCP (Nov 86)

Excel is THE power spreadsheet. Of the Mac, of the world. Has 256- ★★★★★ column by 16,384-row capability. Features include a powerful macro function (with a recorder to make creation simple) and elaborate charting facilities. 512K+ Mac and external drive required. $395. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. NCP (Prem)

MacCalc is a fast, competent, full-featured spreadsheet with im- ★★★★ pressive built-in functions, font control, on-line help, ability to expand columns and rows, and read/write SYLK or WKS files. The worksheet is 125 columns by 999 rows. A very flexible, pure spreadsheet. $139. Bravo Technologies, c/o DPAS, PO Box T, Gilroy, CA 95021. NCP (Sep 86)

MacSpin is a unique and powerful graphic data analysis program. ★★★★ Handles multivariate data in a highly visual manner. Nothing else like it for any micro. $199.95. D² Software, PO Box 9546, Austin, TX 78766-9546. CP (Jun 86)

Mindsight is a professional level decision support and business ★★★★ planning package. Can work with IFPS on mainframes, and is able to transmit models in both directions. Powerful and easy to use. Requires 512K+. $249. Execucom Systems, PO Box 9758, Austin, TX 78766. CP (Dec 86)

Multiplan, the first Mac product from someone other than Apple, is ★★★½ beginning to show its age. Still a very capable basic spreadsheet with simple sorting, 63 columns by 255 rows, many built-in functions, other standard spreadsheet features. $195. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. CP (Mar 86)

Parameter Manager is a data manager, incorporating integrated ★★★★ scheduling, statistics, and graphics. It has solid spreadsheet, calendar, and database functions and reports can be customized using other software. *Parameter Manager* can also import data from *Excel* or *Lotus 1-2-3*. $495. SMS, 651 River Oaks Parkway, San Jose, CA 95134. NCP (Jul 87)

StatView 512+ is a very intuitive statistical analysis program with ★★★★★ tools needed to understand any set of data. Holds data in a spreadsheet-like form. Full-featured, fast, and accurate. Ex-



tremely wide range of analyses possible. Requires 512K+ and 800K of disk space to operate. $349.95. BrainPower, 24009 Ventura Blvd., Calabasas, CA 91302. NCP (Dec 86)

GRAPHICS & DESIGN

CalendarMaker creates monthly calendars in a variety of formats. ★★★★½ Users can incorporate their art and daily notes. Note files can be imported from a variety of DA calendars and outliners. Shareware and prelicensed versions available. $49.95 CE Software, 801-73rd St., Des Moines, IA 50312. NCP (Dec 86)

Canvas is a Draw and Paint program that uses QuickDraw as its ★★★★½ output language. Full of features, including free rotation and one-and-two-point perspective. Also has graphics macro commands, unusual in a program this inexpensive. $195. Deneba, 7855 N.W. 12th St., Suite 202, Miami, FL 33126. NCP (Jan 88)

Chart can easily create area, bar, column, line, pie, scatter, and ★★★½ combination charts. A total of 42 styles are provided. Limited to 100 data items (64 in a series) on a 128K Mac, approximately twice that on a 512K Mac. $125. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. CP

ClickArt Special Effects is a *MacPaint* enhancement desk ★★★½ accessory. Allows the user to distort, stretch, rotate, and use perspective on *MacPaint* documents. A necessary addition for all serious users of *MacPaint*. $49.95. T/Maker, 1973 Landings Dr., Mountain View, CA 94043. NCP (Apr 86)

ColorPrint allows you to print *FullPaint, MacPaint, MacDraw,* and ★★★ *MacDraft* documents in color using the ImageWriter II or ImageWriter I. *Paint* files set up as overlays are read into *ColorPrint*, and the program controls proper positioning registration. $29.95. I/O Design, PO Box 156, Exton, PA 19241. NCP (Mar 86)

Comic Strip Factory is an assembly program for creating comic ★★★★½ strips. Includes a database of parts for various characters and backgrounds for panels. Good text editing in balloons. Can import and export in *MacPaint* format. $89.95. Foundation Publishing, 10301 Yellow Circle Dr., Minneapolis, MN 55343. NCP (Dec 87)

Cricket Draw is an object-oriented drawing program that will pro- ★★★★★ duce stunning, high-quality output. Designed to print on PostScript-compatible devices, such as the LaserWriter. Making shadows and flowing fountain effects is just a point and click away. $295. Cricket Software, 30 Valley Stream Pkwy., Malvern, PA 19355. NCP (May 87)

Cricket Graph easily generates 12 graph types. Multiple windows ★★★★★ can be displayed. *Graph* prints in up to 8 colors with up to 16 patterns. Self-generating macro formatting. *Switcher*, HFS, LaserWriter, and plotter compatible. $195. Cricket Software, 30 Valley Stream Pkwy., Malvern, PA 19355. NCP (Jun 86)

Crystal Paint creates an electronic kaleidoscope. It is *MacPaint*'s ★★★★½ Brush Mirrors gone wild in a small, simple, yet wonderful application. Does not work in color on Mac II. *MultiFinder* friendly. Requires 512K+. $49.95. Great Wave Software, 5353 Scotts Valley Dr., Scotts Valley, CA 95066. NCP (Feb 88)

DeskPaint is a full-blown paint program as a desk accessory. Allows ★★★½ you to spruce up a graphic while in another application. Imports and exports *MacPaint* and TIFF images. Great for DTP, but not enough features to rival the leaders in paint programs. Zedcor, 4500 E. Speedway, Tucson, AZ 85712-5305. NCP (Mar 88)

"Draw it again, Sam..." (v. 1.03) is an object-oriented graphics ★★★★ program, like *MacDraw*, that adds such useful wrinkles as layered drawing, on-screen libraries, and color. Manual is weak. Requires 512K+ and an 800K disk drive. $150. Aba Software, PO Box 850, Frazer, PA 19355. NCP (Feb 88)

Easy3D is a three-dimensional, solid modeling masterpiece. Four ★★★★ variable light sources, powerful sculpting tools, and an exquisite user interface make this a must-have for graphics enthusiasts. Requires 512K+. $149. Enabling Technologies, 600 S. Dearborn, Chicago, IL 60605. NCP (May 86)

EZ Draft is a high-level CAD application. Does things usually only ★★★ found on minicomputer programs. Uses "pop-up" menus to supplement a full set of pull-down menus. Comes with an additional set of printer/plotter/monitor drivers. A real powerhouse. $1995. $500 for IEGS module to link to other CAD programs. Bridgeport Machines, 500 Lindley St., Bridgeport, CT 06606. CP (May 87)

FastForms! Construction Kit is both a fast and efficient business ★★★★★ forms creator (a drawing program) and a specialized application (and DA) to fill out the data fields in your forms. $149 (US). Shana Enterprises, 9704 54th Ave., Suite 200, Edmonton, Alberta T6E 0A9, Canada. NCP (Nov 87)

Fluent Fonts is a two-disk collection of fonts. Forty-nine different ★★★★ items are included. All install easily in user systems. Most are well executed and some are extraordinarily nice. This is a real bargain for font lovers. $49.95. CasadyWare, PO Box 223779, Carmel, CA 93922. NCP

Fontastic is the best font editor now available for the Mac. Features ★★★★½ a large editing window with a grid to make positioning easy. Select letters to edit by clicking on a matrix of the font. Allows scaling of existing fonts and previewing the various styles. $49.95. Altsys, PO Box 865410, Plano, TX 75086. NCP (Dec 85)

Fontographer is a complex, but excellent laser font creator. The ★★★★½ fonts created have 300 bits-per-inch resolution. The fonts are actually downloadable PostScript files. $395. Altsys, PO Box 865410, Plano, TX 75086. CP

FullPaint is an expanded version of *MacPaint*. Features include full- ★★★★★ screen drawing, multiple documents opening simultaneously, brush editing, movable tool palettes, special text effects, and much more. It fills the gaps left by *MacPaint*. $99.95. Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90502-1319. NCP (Jun 86)

GraphicWorks 1.1 is a powerful drawing and painting program that ★★★★ creates high-resolution bit-maps. Easels contain graphics, balloons hold text, and both reside on panels. Graphic primitives are now a separate tool. $149.95. Mindscape, 3444 Dundee Rd., Northbrook, IL 60062. NCP (Oct 87)

Graphidex indexes *MacPaint* and *MacDraw* format graphics without ★★½ removing them from their original documents. Indexed graphics are retrieved via the *Graphidex* DA. Can modify an indexed graphic without affecting the original. Best for bit-mapped (*Paint* format) images but the design is questionable and the execution imperfect. Requires 512K+. $124.95. BrainPower, 24009 Ventura Blvd., Calabasas, CA 91302. NCP (May 87)

GridMaker is a tool for artists who use perspective. The program ★★★ automatically generates a series of three-dimensional plane sets that can be pasted into *MacDraw*. Sizes and viewing vantage points are easily modified. $49. FolkStone Design, PO Box 86982, North Vancouver BC V7L 4P6, Canada. NCP (Nov 86)

Illustrator is a professional-level graphics program. Unique and ★★★★½ powerful drawing technique. Program uses templates for precise and detailed art work. Requires 1M+. $495. Adobe Systems, 1870 Embarcadero Rd., Palo Alto, CA 94303. CP until registered (Jul 87)

Image Studio puts a photo-retouching lab on the desktop. Editable ★★★★★ brushes let you modify digitized images in 65 gray levels. Requires 1M+ and two 800K disk drives. Mac II and *Multi-*

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MINIFINDERS



Finder friendly. Version 1.0 reviewed. $495. Letraset USA, 40 Eisenhower Dr., Paramus, NJ 07653. NCP (Jun 88)

Images with Impact! brings clip art out of the turn-of-the-century woodcut style and into a modern graphic sensibility. "Graphics and Symbols 1" is the first in a series. Requires a program that reads Encapsulated PostScript (EPS) files. $99.95. 3G Graphics, 11410 NE 124th St., Kirkland, WA 98034. NCP (Jun 88)

Japanese Clip Art is a two-disk set of extraordinary Japanese clip art. Consists of *MacPaint* documents and separate fonts. Volume I, Heaven, covers mythological subjects; Volume II, Earth, has secular subject matters. $79.95 each volume; $149.95 set. Qualitas Trading, 6907 Norfolk Rd., Berkeley, CA 94705. NCP (Apr 87)

LaserFonts are new fonts for the LaserWriter. Users download them to their machines. Very high quality and very simple to use. *Willamette* looks like Avant Garde. *MicroFonts* provides tiny, expanded, and condensed versions of the LaserWriter's own fonts. $34.95 to $44.95 each. Century Software, 2483 Hearst, #175, Berkeley, CA 94709. NCP

LaserPaint's clumsy interface makes it a slow program. There's good laser output, if you persevere through the creation of a document. The support is scads better than the documentation, which is lousy. Version 1.1.4. $495. LaserWare, PO Box 668, San Rafael, CA 94915. CP (Jan 88)

Lasertalk is a PostScript programming tool that establishes interactive contact with laser printers. Preview window and on-line help make it a powerful tool. Requires 1M+ and a PostScript Printer. $249. Emerald City Software, PO Box 2103, Menlo Park, CA 94026. CP until registered (May 88)

The Mac Art Dept. is a collection of over 150 graphic images ranging from foods to hands holding signs to borders. Best suited for letterheads, memos, other business use. $39.95. Simon & Schuster, Computer Software Div., 1 Gulf + Western Plaza, New York, NY 10023. NCP (Mar 86)

Mac-a-Mug is an Identikit-type program for creating faces from facial feature files. Uses scroll bars that are slow and jerky. Lots of creative fun. 1M+ Mac required. $59.95. Shaherazam, PO Box 26731, Milwaukee, WI 53226. CP (Jul 86)

MacCalligraphy is the best simulation of brush painting in any graphics program. User-designed Seals and Touches enable you to design your own signature tool and the style of brush you use. Comes with a clip art disk. $175. Qualitas Trading, 6907 Norfolk Rd., Berkeley, CA 94705. NCP (Feb 88)

MacDraft is an object-oriented graphics program. It sports advanced features such as variable scaling, single degree rotation, complex arcs, and a FatBits-like magnification mode. Best used to complement *MacDraw*, not replace it. $269. Innovative Data Design, 2280 Bates Ave., Concord, CA 94520. NCP (Feb 86)

MacDraw is an object-oriented structured graphics program. Can be used to design forms, create presentation materials, and do technical illustrations. Drawing sizes up to 8 feet by 10 feet are possible. Text can be easily generated and integrated in the graphics. $195. Claris, 440 Clyde Ave., Mountain View, CA 94043. NCP (Nov 85)

MacModel is an economical 3D package with shading. Somewhat sketchy Mac interface, shading speed slow (but acceptable), grainy image resolution. On-line help screens are a welcome addition. Frequent updates and low price make this a reasonably good buy. $40. A.P.P.L.E. CO-OP, 290 SW 43rd St., Renton, WA 98055. NCP (Aug 86)

MacPaint is the graphics program that started a whole new genre. Still the best freehand graphics tool. Version 1.5 supports 512K+ Macs and the LaserWriter. Multiple tools, patterns, and features too numerous to describe. A work of art for artists. $125. Claris, 440 Clyde Ave., Mountain View, CA 94043. NCP

Mac3D 2.0 is a feature-laden 3D program with a *MacDraw*-like interface. PostScript-resolution shading with six variable light sources, user-definable tools, and many more features make this a powerhouse. $249. Challenger Software, 18350 Kedzie Ave., Homewood, IL 60430. NCP (Jan 87)

MapMaker produces maps and analyses of related geographical data. Additional data disks available. Documentation could be better. Requires 512K+; 2nd drive recommended. $295. Select Micro Systems, 40 Triangle Ctr., Yorktown Heights, NY 10598. NCP (Jan 87)

MGMS: Professional CAD for Macintosh offers more than 200 functions. Very complete, capable program. Groups, Dimension, Libraries, etc., are standard. Sometimes confusing — designed for experienced, professional CAD user, not the novice. Full plotter support. 512K+. $799. Micro CAD/CAM, 3230 Overland Ave., Los Angeles, CA 90034. NCP (Nov 87)

MiniCad V3.0 is a pro level CAD package. Vast array of features, many accessible only through Command/Shift/Option key combinations. Works in 2D or 3D with easy transition from one to the other. *MacDraw*-like interface makes it easy to learn and use. Requires 512K+. Diehl Graphsoft, 8370 Court Ave., Suite 202, Ellicott City, MD 21043. CP (Oct 87)

Phoenix 3D is an economical 3D drawing package, with features that belong in a more expensive program. Multiple light sources, fine object placement and orientation control, and a good selection of shapes. $49.95. Dreams of the Phoenix, PO Box 10273, Jacksonville, FL 32247. NCP (Oct 86)

PictureBase is a powerful graphic librarian. You can store paint and PICT formatted items and attach keywords for later search and retrieval. $69.95. Symmetry, 761 E. University Dr., Mesa, AZ 85203. NCP (Sep 87)

PixelPaint is a color paint program with customizable palettes and lots of special effects. Slow OPEN and SAVE. Requires Mac II and 8-bit video card. $495. SuperMac Software, 295 N. Bernardo Ave., Mountain View, CA 94043. NCP (May 88)

The Print Shop makes it easy to create greeting cards, signs, banners, and letterheads. Uses its own special graphics and can import *Paint* files. Hard disk users get version 1.02 or higher. $79.95. Broderbund, 17 Paul Dr., San Rafael, CA 94903. CP (Sep 87)

Space Edit is a 3D CAD program. Display shows top, front, side, and axonometric views of an object, all at once or one at a time. Has standard CAD features plus zoom, exploded view, animated flyover. Suppression of hidden lines is very slow. Requires 1M+. $625. Abvent, 9903 Santa Monica Blvd., Beverly Hills, CA 90212. CP (Jul 87)

Storyboarder produces working animated storyboards for use in film and video production. Imports graphics from *MacPaint;* allows screen masking to simulate television, 35mm or 70mm screen widths; allows limited animation and special effects. $495. American Intelliware, PO Box 6980, Torrance, CA 90504. CP (Nov 86)

SunShine Graphics Library is a collection of 46 400K disks (to date) with a wide variety of high-quality digitized images stored as *MacPaint* files. $20/disk: discount scale for multiple purchases. SunShine, Box 4351, Austin, TX 78765. NCP (Feb 87)

SuperPaint is a powerful, easy-to-use graphics program with all the best features of *MacPaint* and *MacDraw* — and then some. LaserBits provides 300 dpi magnification and there are 40 editable brush shapes. Requires 512K+. $149.95. Silicon Beach, 9580 Black Mountain Rd., PO Box 261430, San Diego, CA 92126. NCP (Feb 87)

MINIFINDERS



TrueForm takes a scanned image of a paper form and turns it into
★★★★½ an electronic equivalent, complete with fields for entering data. It can automatically sum numeric fields. Requires external 800K drive. $495; run-time version, $295. Spectrum Digital Systems, 2702 International Lane, Madison, WI 53704-3122. NCP (May 88)

VideoWorks II is an easy-to-use animation tool — the best avail-
★★★★½ able on the Mac. Has an Overview mode that acts as a slide show carousel for presentations. Works in color on the Mac II. $195. Requires 1M+ and an 800K drive. MacroMind, 1028 W. Wolfram, Chicago, IL 60657. NCP (Mar 88)

WetPaint consists of two 3-disk volumes of very high quality clip
★★★★★ art. Also includes the *Art Roundup* DA, a good art browser/editor. Volume 1 or 2, $39 each; both volumes, $59. Available in *PictureBase* format for $15 extra per volume. Dubl-Click Software, 18201 Gresham St., Northridge, CA 91325. NCP (Sep 87)

World-Class Fonts! comes in two volumes of three disks each.
★★★★½ Includes all the *Mac the Knife* fonts and a lot more, including two useful utilities. This is now the best collection of ImageWriter fonts available. Each volume: $39; both volumes: $59. Dubl-Click Software, 18201 Gresham St., Northridge, CA 91325. NCP (Dec 86)

DESKTOP PUBLISHING

Interleaf Publisher is a speedy multiuser layout system for produc-
★★★½ ing large, complicated documents. Has strong global formatting ability but can't use downloadable fonts. Requires Mac II with 5M of RAM and 40M hard disk, $2495. Interleaf, 10 Canal Park, Cambridge, MA 02141. NCP (May 88)

JustText is a professional level word processor and page makeup
★★★★½ program that generates PostScript output. Comes with a set of LaserWriter utilities that allow total manipulation of art and text. Requires LaserWriter or other PostScript compatible output device. $195. Knowledge Engineering, GPO Box 2139, New York, NY 10116. NCP (Dec 85)

MacTEX (v. 2.0) is the TeX environment of choice for hardcore TeX
★★★½ users on the Macintosh. Very intimidating for others. Painfully slow and visually unattractive. Requires 1M+. $750. FTL Systems, 234 Eglington Ave. East, Toronto, Ontario M4P 1K5, Canada. NCP (Apr 88)

PageMaker uses a graphics studio metaphor to make this layout
★★★★½ program a natural for pasteup artists. Version 2.0 adds automatic kerning and hyphenation. Still the standard. Excellent documentation. Could use a global search and replace for design elements. $495. Aldus, 411 First Ave. South, Seattle, WA 98104. NCP (Oct 87)

Portfolio: Designs for Newsletters provides over 20 templates for
★★★★ 2-page newsletters with pre-set columns, headlines, graphics, and captions. Documentation provides excellent tutorial in page design. Requires 512K+; *PageMaker*. $79.95. Aldus, 411 First Ave. S., Suite 200, Seattle, WA 98104. NCP (May 87)

QuarkXPress is a high-end desktop publishing application. Layout
★★★★★ is done in block format; powerful lining tool ties blocks together. $695. Quark, 200 S. Jackson, Denver, CO 80209. NCP (Sep 87)

Ragtime is an "Integrated Page Processor" with text, graphics, and
★★★★ built-in spreadsheet. Flow text automatically from one frame to another. Spreadsheet has a full set of functions. Excellent, easy-to-use program. Requires 512K+. $395. Orange Micro, 1400 N. Lakeview, Anaheim, CA 92807. NCP (Apr 87)

Ready, Set, Go! 4 has an elegant interface and excellent manual.
★★★★½ Powerful text wraparounds, fast word processor with hyphenation and spelling check and custom stylesheets. Requires 1M+. $495. Letraset, 40 Eisenhower Dr., Paramus, NJ 07652. NCP (Feb 88)

Scoop could someday be the world's best desktop publishing pro-
★★½ gram, but version 1.0 isn't it. There are various ways to cause the program to bomb which need to be fixed. The manual is poorly organized and lacks tutorials. $495. Target Software, 14206 SW 136th St., Miami, FL 33186. NCP (Feb 88)

TeXtures (v. 1.0) is an implementation of TeX, the big daddy of
★★★ typesetting programs. Good for people trained on mainframes in the early days. Otherwise very sticky with a high learning curve. Requires 512K+. $495. Kellerman & Smith, 534 S.W. 3rd Ave., Portland, OR 97204.. NCP (Apr 88)

COMMUNICATIONS

AppleShare is the long awaited file sharer from Apple. Software-
★★★★ based, *AppleShare* requires you to dedicate a Mac and a hard disk to run it. Allows users on the network to protect things from other users on the folder level. Interface to network is provided at a revised *Finder*. $799. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. NCP (May 87)

ComServe allows you to share a Hayes-compatible modem over an
★★★★ AppleTalk network. You can call out, but you can't call in. Works with most telecommunications packages. $195 per server. Infosphere, 4730 SW Macadam Ave., Portland, OR 97201. CP (Feb 88)

Desktop Express is a simple to use, semi-automated program for
★★★½ using MCI Mail and Dow Jones News/Retrieval. Performance is traded off for ease of use. Requires 512K+. $149. Dow Jones, PO Box 300, Princeton, NJ 08543. NCP (Jan 88)

HomePak is a package consisting of *HomeTerm*, an excellent, sim-
★★ ple telecommunications program with strong macro features; *HomeFind*, an electronic filer as bad as *HomeTerm* is good; and Apple's *Edit*, a simple, non-HFS-compatible text-file editor. $49.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. NCP (Sep 86)

InBox is an easy-to-use mail system. It's called up from a desk
★★★★½ accessory. Has a very slick interface. Dedicated Mac not required. $350 for starter set which includes one Administrator disk and three Connection disks. Additional Connections cost $125 each. Think Technologies, 135 South Rd., Bedford, MA 01730. NCP (May 87)

InTalk comes with its own communications command language
★★★★½ able to do unattended sessions. Supports Xmodem and MacBinary. Has a macro key function. Many sample setup documents and command language files provided. $195. Palantir, 12777 Jones Rd., Houston, TX 77070. NCP (Prem)

MacTerminal provides basic telecommunications and terminal em-
★★½ ulation. Doesn't have macros nor any sort of auto re-dial/auto log-on capability. Best for those needing faithful VT100 or IBM 3278 emulation — it is superb at those. $125. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. NCP (Prem)

Microphone is a high-powered terminal program that's easy
★★★★½ enough for novices. Very powerful command language allows full automation of communications, if desired. $149. Software Ventures, 2907 Claremont Ave., Berkeley, CA 94705. NCP (Jul 86)

Microsoft Mail is an electronic mail system that runs under Apple-
★★★★½ Talk. Supports file transfers across the mail system. Full online help facility. Also includes "While you were out" messages. Desk accessory based. Prices determined by number of users licensed. One to four users, $299.95; 5 to 10 users, $499.95; 11 to 20 users, $749.95; 21 or more users, $949.95. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. NCP (May 87)

Red Ryder is a full-featured telecommunications program that sup-
★★★★★ ports MacBinary, Xmodem, and Kermit. Has big screen support, auto procedure creator, and up to 30 keyboard macros.

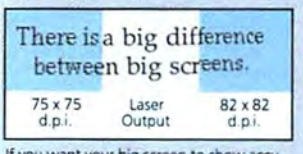
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MINIFINDERS



This is the cream of the crop (in late 87). $80. Freesoft, 150 Hickory Dr., Beaver Falls, PA 15010. NCP (Dec 87)

Smartcom II balances power and ease of use. Capable of unattended operation and has a very powerful command language. Supports MacBinary, Xmodem, and Hayes Verification protocols. The large screen buffer can easily be archived. $149. Hayes, 5923 Peachtree Industrial Blvd., Norcross, GA 30092. NCP (Jul 86)

Telescape is the power telecommunicator's terminal program. Can be configured to emulate any terminal. The documentation does not adequately explain the many features. $125. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. NCP (Jun 86)

TOPS is a file server designed to network computers with different operating systems. Supports Macs, MS-DOS compatibles, and UNIX. Access to files and subdirectories is transparent to the user; they appear as Mac folders. Only handles ASCII or Text files. $149 for Mac version. $389 for PC's (comes with add-on card). TOPS, 2560 Ninth St., Berkeley, CA 94710. Serial number protected. (May 87)

VersaTerm features include DEC VT100 and VT52, Tektronix 4014 graphics terminal and Data General DG200 emulation. Supports Xmodem and *MacTerminal* Xmodem protocols and MacBinary. *VersaTerm* is easy to use and well-documented. $99. Peripherals, Computers & Supplies, 2457 Perkiomen Ave., Mt. Penn, PA 19606. CP (Prem)

VersaTerm-Pro is a very powerful terminal program with several special features. Does one of the best VT100 emulations available and specializes in high-quality Tektronix 4014 and 4105 emulation. A pro's tool. Requires 512K+. $295. Peripherals, Computers & Supplies, 2457 Perkiomen Ave., Mt. Penn, PA 19606. NCP (Apr 87)

WORD PROCESSORS

Document Compare allows users to compare any two *MacWrite* 4.5, ASCII, or MDS documents. Differences in spelling, punctuation, formatting, and wording are detected. Documents can be printed out with differences highlighted. $99. Legalware, 33 Young St., Toronto, Ontario M5E 1S9, Canada. NCP (May 86)

Document Modeler can automate much of a professional office's correspondence. Comes in two parts: *Template Maker* and *Document Maker.* Initial setup requires time and is complex. $299.95. Legalware, 33 Young St., Toronto, Ontario M5E 1S9, Canada. NCP (Mar 87)

Doug Clapp's Word Tools is a useful punctuation and style editing program. It won't turn you into a Proust, but it will help you make your writing cleaner and clearer. Word counts among different formats show discrepancies, but not to worry. Requires 512K+. $79.95 Aegis Development, 2125 Pico Blvd., Santa Monica, CA 90405. NCP (Sep 87)

Expressionist is a powerful DA that allows you to create complex mathematical equations from within an application. Equation manipulation has never been easier. $79.95. Allan Bonadio Associates, 1579 Dolores St., San Francisco, CA 94110. NCP (Jul 87)

Kadmos Greek Font is a full character set of ancient Greek that prints on any PostScript printer. Requires learning new typing skills, but excellent quality makes it worth the effort. $85. Allotype Typographics, 1600 Packard Rd., Ann Arbor, MI 48104. NCP (Oct 87)

Laser Author is a high-powered, technically oriented word processor. Good math setting capability. Has style sheets, word count, and page layout capability. $199.95. Firebird Licensees, PO Box 49, Ramsey, NJ 07446. NCP (Mar 87)

Liberty Spell Checker is a fast, effective, interactive checker. The dictionary is smaller than average, but well chosen. Unfortunately, it has a few misspelled words. $59.95. DataPak, 14011 Ventura Blvd., Sherman Oaks, CA 91423. CP (Oct 86)

Lookup is an on-call, quick single word spelling checker. Designed for the way writers really work. Uses the 93,000+ word *Spellswell* dictionary. $49.95. Working Software, 321 Alvarado, Suite H, Monterey, CA 93940. (Dec 87) NCP

MacGAS is a DA spelling checker with both a small and extended dictionary. Its best point is the excellent thesaurus, provides antonyms & glossary. A slow checker. $99. EnterSet, 2380 Ellsworth, Berkeley, CA 94720. CP (Oct 86)

MacProof is a grammar, style, and spelling checker that's like having your own personal copy editor. Grammar rules are fixed, and you may not agree with the choices. The program

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only suggests corrections, it doesn't make them for you. And the checking process can be slow if your document is long. $195 for standalone version; $2500 for networked version. Automated Language Processing Systems, 190 West 800 North, Provo, UT 84604. NCP (Apr 87)

Macspell+ (version 1.10) is a spelling checker that installs as a ★★★★ desk accessory. Works easily with *MacWrite* 4.5 and 2.2 and *Word*, but has some drawbacks. New version just available. Requires 512K+, two drives or hard disk. $99. Creighton Development, 16 Hughes St., Irvine, CA 92718. NCP

MacWrite is starting to show its age. While still a good, basic ★★★½ program, it's out-performed by its competition. Probably enough for the occasional user. Version 5.0 includes Command key equivalents and spell checker. Requires 512KE+. $125. Claris, 440 Clyde Ave., Mountain View, CA 94043. NCP (Jun 88)

MergeWrite is a mail merge program for *MacWrite* (also works with ★★★½ ASCII files). Program combines names and addresses from a data file into predefined fields in a form letter. Also allows simple conditional IF-THEN-ELSE equations. $49.95. Software Discoveries, 137 Krawski Dr., South Windsor, CT 06074. NCP (Dec 87)

MindWrite integrates outlining and word processing better than ★★★★ anyone. Version 1.1 fixes many problems of the earlier version. Sophisticated search and select options. Unimpressive speed. $295. Access Technology, 555C Heritage Harbor, Monterey, CA 93940. NCP (Feb 88)

QUED/M (v. 2.01) is an excellent text editor that saves docu-★★★★½ments in a form readable by most computers, and printers. Doesn't support graphics or multiple fonts. Programming language allows creation of database. $129. Paragon Concepts, 4954 Sun Valley Rd., Del Mar, CA 92014. NCP (Mar 88)

QuickWord is a word processing accessory that adds sophisticated ★★★½ glossaries to *MacWrite*. Simple to install and use, yet powerful and efficient. $49.95. EnterSet, 2380 Ellsworth, Berkeley, CA 94720. NCP

Scriptor is designed for producing standard format scripts. Starts ★★★★ with a *Word* document. As you change your *Word* document, *Scriptor* will reformat, renumber, and reprint the script. Supports LaserWriter and daisywheel printers. $295. Screenplay Systems, 348 E. Olive Ave., Suite F, Burbank, CA 91502. NCP (May 87)

Spelling Champion is a fast and accurate batch-type spelling ★★★★ checker. Back-up feature allows you to undo corrections in a paragraph. Works only with *MacWrite* 4.5. $39.95. Champion Software, 6617 Gettysburg Dr., Madison, WI 53705. NCP (Oct 86)

Spellswell is an effective and powerful standalone spelling checker. ★★★★★ It has many advanced features such as capitalization and homonym checking and comes with a large, well-chosen dictionary. Very good dictionary, good value. $74.95. Working Software, 321 Alvarado, Monterey, CA 93940. NCP (May 86)

Thunder! is one of the best spelling checkers around. Features ★★★★★ Learned Words (a superb glossary) and statistics. A very fast DA, it works interactively and in selection mode. Requires 512K+. $49.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. NCP (Dec 86)

Word 3.01 fixes many of the bugs of the justly maligned 3.0. Still, ★★★★½ it's the most feature-laden word processor around. Also has Microsoft's somewhat unusual view of what the Mac interface is. Esoteric command key combinations. Requires 512K+. $395. Microsoft, 16011 NE 36th Way, Redmond, WA 98073. NCP (Mar 88)

WorksPlus Spell is a speedy spelling and hyphenation checker for ★★★★½ *Microsoft Works*. It includes a glossary for abbreviations and time/date stamping. The biggest drawback is its limitation to one program. $59.95. Lundeen & Associates. PO Box 30038, Oakland, CA 94604. NCP (Oct 87)

Write is a "beginner's" version of *Word* 3.0. More features than ★★★ some word processors in its class, but not all of the features work well. Poor value, and expensive upgrade path to *Word*. $175. Requires 512K+. Microsoft, 16011 NE 36th Way, Box 97017, Redmond, WA 98073-9717. NCP (May 88)

WriteNow for the Macintosh has many of the features of *MacWrite* ★★★★½ and then some, including the ability to work in columns. Has built-in spelling checker with 50,000-word dictionary. $175. T/Maker, 1973 Landings Dr., Mountain View, CA 94043. NCP (Mar 87)

SYSTEM SOFTWARE

HyperCard is a totally unique program for the Mac. It uses an index ★★★★ card metaphor and it contains a programming language, HyperTalk. Requires 1M+. Free with new Macs, otherwise $49.95. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. NCP (Dec 87)

System Tools 5.0 is the Apple System upgrade for Mac Plus, SE, ★★★★ and II owners. It contains *MultiFinder* (a multitasking environment), a LaserWriter spooler, and a Control Panel resource to add color on the Mac II desktop. Takes 1M+. $49. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. NCP (Mar 88)

HYPERCARD

Business Class is a *HyperCard* stack that contains world travel ★★★½ information and itinerary planning. Uses maps to locate countries of interest, but it lacks United States domestic travel information. Requires 1M+ and *HyperCard*. $49.95. Activision, 2350 Bayshore Pkwy., Mountain View, CA 94043. NCP (Mar 88)

Focal Point is a *HyperCard* stack that ties together a calendar, ★★★★½ phone log, client accounts, and more in one easy-to-use organizational tool. Requires 1M+ and *HyperCard*. $99.95. Activision, 2350 Bayshore Pkwy., Mountain View, CA 94043. NCP (Mar 88)

HyperBook Maker adds many of the printing utilities that *Hyper-*★★★ *Card* lacks. Best used to figure out signature breaks to print pamphlets. Version 1.1a reviewed. Mac II and *MultiFinder* friendly. $59.95. Ideaform, 612 West Kirkwood, Fairfield, IA 52556. NCP (Jun 88)

HyperDA lets you browse through *HyperCard* stacks through a desk ★★★★ accessory. A true equalizer for 512K Mac owners who cannot normally access stackware. Doesn't support global variables. Requires 512K+. $69. Symmetry, 761 E. University Dr., Mesa, AZ 85203. NCP (May 88)

HyperTutor is a stack that teaches HyperTalk, *Hypercard*'s pro-★★★★½ gramming language. Uses an interactive Test Mac on each card to write scripts. A variety of windows makes it good for both beginners and advanced programmers. $49.95. Teligraphics, 936 Sir Francis Drake Blvd., Kentfield, CA 94904. NCP (Apr 88)

ORGANIZATIONAL TOOLS

Acta is an outline processor in desk accessory format. It has practi-★★★★½ cally all the power of a standalone program, and then some. Can save files as *Acta* outlines, *MacWrite* or text files. $59.95. Symmetry, 761 E. University Dr., Mesa, AZ 85203. NCP (Jul 86)

Calliope is a new type of outlining program. Chunks of information ★★★ are manipulated as small "light bulbs" containing text. Related elements can be graphically connected, and their text

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information viewed in hierarchical order. Text files can be created for *MacWrite* editing. $99. Innovision, PO Box 1317, Los Altos, CA 94023. NCP (Sep 86)

Comment (previously known as *Memorandum*) is the electronic ★★★½ equivalent of Post-it Notes. Notes can be attached to many different types of documents. Doesn't work well with *SuperPaint* or *Microsoft Works*. An alarm clock feature alerts users of Timed Notes. $99.95. Deneba Systems, 14206 SW 136th St., Miami, FL 33186. NCP (Nov 87)

Design is a powerful organizational tool. It goes beyond mere flow-★★★★ charting. Complex, detailed program aimed at software pros. $250. Meta Software, 150 CambridgePark Dr., Cambridge, MA 02140. NCP (Apr 87)

FlowMaster charts your ad dollars in print, TV, billboard, and other ★★★★★ mediums. Analyzes cost/benefit of a campaign in terms that even jaded Mad. Ave. execs will find innovative. Includes bar-chart and tabular output. Requires 512K+. $495. Select Micro Systems, 40 Triangle Ctr., Yorktown Heights, NY 10598. NCP (Jan 88)

Guide allows you to "cross reference" from within a document ★★★★½ using hypertext. You can set up words or sections of the document so that double-clicking brings up explanatory material, graphics, and other useful items. The word processing and formatting functions, however, are limited. $135. OWL International, 14218 NE 21st St., Bellevue, WA 98007. NCP (Apr 87)

Instant Expert is an excellent way to learn the mechanics of creat-★★★½ ing an expert system. The inference engine (that ultimately finds the answer) is visible. Lacks a true Mac interface. Version 1.0. $49.95. Human Intellect Systems, 1670 S. Amphlett Blvd., Suite 326, San Mateo, CA 94402. NCP (Jan 88)

MacProject allows a user to plan and track a project from beginning ★★★ to end. Uses CPM to produce schedules with start and finish dates for each task. Can report on resource interdependencies and generate all needed printed reports. $195. Claris, 440 Clyde Ave., Mountain View, CA 94043. NCP (Mar 86)

MacSMARTS can create small standalone expert systems. Fea-★★★ tures hypertext connections to Paint, PICT, SYLK, and text files. Still a little buggy. Requires 512K+. Version 1.03. $149.95. Cognition Technology, 55 Wheeler St., Cambridge, MA 02138. NCP (Jan 88)

Micro Planner Plus is a great project management system. Out-★★★★½ standing analysis capability. Memory based, making it much faster than the original. Includes a font menu. Even saves reports out in *MacDraw* format for further work. Uses standard print drivers. HFS compatible. $495. Micro Planning International, 235 Montgomery St., San Francisco, CA 94104. NCP (Dec 86)

MORE is an incredibly powerful outline processor with gobs of great ★★★★★ features: instant charts, math capabilities, multiple windows, font and style control, templates, and more. Prints outlines in any of several standard formats, even in color. Requires 512K+. $295. Living Videotext, 117 Easy St., Mountain View, CA 94043. NCP (Jan 87)

PowerPoint is a comprehensive presentation creation tool. Han-★★★★ dles 35mm slide and overhead transparency formats. Good graphics and text editing capabilities. Requires 512K+.

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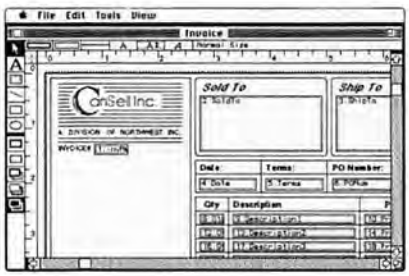
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\$395. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. NCP (Aug 87)

STELLA for Business is a simulation tool used to model complex ★★★★½ business systems. Requires that you master a discipline called "system dynamics." Requires 512K+. Mac II version available. \$350. High Performance Systems, 13 Dartmouth College Hwy., Lyme, NH 03768. NCP (Jun 88)

ThinkTank 512 is a very fast and intuitive organizational tool. Full ★★★ keyboard control is possible. Can store and paste graphics into outlines. Slide show feature allows high-quality presentations to be created. Good report formatting and printing capability. \$195. Living Videotext, 117 Easy St., Mountain View, CA 94043. CP (Jan 86)

DESK MANAGERS

Executive Office is a jack of all trades office application. Good ★★★½ database, word processing, graphics, and minispreadsheet. Available on 400 or 800K disks; get the 800 if you can. \$249.99. DataPak, 14011 Ventura Blvd., Sherman Oaks, CA 91423. CP (Mar 87)

Front Desk lets small businesses and offices easily keep track ★★★ of personnel schedules, activities, and payments. The program can keep track of up to 15 employees, functioning as a day-, week-, and month-at-a-glance calendar. \$149.95. Layered, 529 Main St., Boston, MA 02129. NCP (Dec 85)

MockPackage+ is a set of extremely powerful DAs. Includes a text ★★★★½ editor, text printer (supports LaserWriter), charter, terminal, and EZmenus. HFS compatible. \$35. CE Software, 801-73rd St., Des Moines, IA 50312. NCP (Mar 87)

My Office lets you handle your files and papers in much the same ★★★★ way you did before you got a computer. Excellent use of graphic symbols. \$129.95. DataPak, 14011 Ventura Blvd., Sherman Oaks, CA 91423. CP (Prem)

SideKick 2.0 beefs up original *SideKick* DAs and adds two major ★★★★ new ones — *MacPlan*, (formerly *Click-On Worksheet*) and *Outlook*, a full-featured outliner. Also comes with seven applications to support the desk accessories. \$99.95. Borland International, 4585 Scotts Valley Dr., Scotts Valley, CA 95066. NCP (Jun 87)

Smart Alarms is the best reminder system for the Mac. Easy to use, ★★★★½ versatile and, well, smart. This self-running DA automatically reminds you of anything you enter into its Reminder file, giving you a wide range of useful advance warning options. \$49.95. Imagine Software, 19 Bolinas Rd., Fairfax, CA 94930. NCP (Oct 86)

Top Desk is a set of 7 self-installing (and self-removing) DAs. *Menu* ★★★★½ *Key* adds Command key sequences to programs; *View* allows looking at and moving data between up to 8 *MacWrite* documents; also included are *BackPrint*, *Touch 'n' Go*, *Blank*, *Encrypt*, and *Launch*. \$59.95. Cortland Computer, PO Box 9916, Berkeley, CA 94709. NCP (May 86)

UTILITIES

Accessory Pak 1 is a set of useful applications and utilities. *Paint* ★★★★ *Cutter* alone is worth the price. That program allows users to



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browse and manipulate full page *MacPaint* documents. $39.95. Silicon Beach, PO Box 261430, San Diego, CA 92126. NCP (Nov 85)

AutoSave DA is insurance against system crashes. It saves your ¢¢¢ work automatically at intervals from 1 to 99 minutes. Compatible with many applications, but not recommended for use with databases. $49.95. Magic Software, 1706 Galvin Rd. S., Bellevue, NE 68005. NCP (Jan88)

Capture saves any portion of a Macintosh screen to the Clipboard or ¢¢¢¢¢ as a PICT file. Works in color on the Mac II. Requires 512K+. *MultiFinder* friendly. $59.95. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. NCP (Jun 88)

Colorizer adds pigments to the desktop and black and white appli- ¢¢¢ cations. Also colors PICT graphics. System resources include saving and printing color screens. A useful novelty that'll run its course as developers add color to apps. Requires Mac II. $49.95. Palomar Software, PO Box 2635, Vista, CA 92083. NCP (Jan 88)

Copy II Mac does efficient sector and bit copies and in its latest ¢¢¢¢¢ version can back up virtually all Mac software. Features graphic displays of copy progress. Comes with *MacTools*, a multi-use utility that can recover many damaged files. $39.95. Central Point Software, 9700 SW Capitol Highway, Portland, OR 97219. NCP (Apr 86)

DiskExpress unfragments disk volumes by reorganizing data into ¢¢¢¢ continuous sectors and arranging files to slow down further fragmentation. Works with *MacServe*, floppy drives, and most hard drives. Requires 512K+. $39.95. ALSoft, Box 927, Spring, TX 77383. NCP (Feb 87)

DiskFit is a utility for backing up and restoring hard disk files. Cre- ¢¢¢¢½ ates a "SmartSet" of floppy disks so incremental back-ups only update files modified since the last back-up procedure. Backs up to floppies or another hard disk. Requires 512K+. $74.95. SuperMac Software, 295 N. Bernardo Ave., Mountain View, CA 94043. NCP (Jun 87)

DiskQuick is an easy-to-use cataloging program. Criteria selection ¢¢¢¢ option for generating subcatalogs. Requires 512K+. $49.95. Ideaforms, PO Box 1540, Fairfield, IA 52556. NCP (Apr 87)

Disk Ranger is a speedy cataloging program that doubles as an ¢¢¢¢ efficient labelmaker. Comes with pinfeed labels. Works with regular and hard disks. Can catalog HFS systems. $34.95. Graham Software, 8609 Ingalls Circle, Arvada, CO 80003. NCP (Mar 86)

DiskTop is a desk accessory *Finder* replacement of extraordinary ¢¢¢¢½ power and ease of use. Comes with the useful *LaserStatus* DA and *Widgets* application. The extras alone are worth the price. Requires 512K+. Upgrade from version 1.0, $7; $10 with new manual. $49.95. CE Software, 801-73rd St., Des Moines, IA 50312. NCP (Aug 87)

DiskTools Plus is a set of 8 useful DAs and applications. Earlier ¢¢¢¢¢ version was sold as *Battery Pak*. The DA *Disk Tools II* is a *Finder* replacement. Also included are an RPN calculator, *Phone Pad*, and *Calendar Manager*. Requires 512K+. $49.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. NCP (Mar 88)

Dubl-Click Calculator Construction Set lets users design person- ¢¢¢¢½ alized calculators with a variety of standard and special func-

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Easy Checks puts your check register (or credit card records or any ½ other simple financial account) into a desk accessory. Creating formats is rough, can't save reports to disk and there's no LaserWriter support. Requires 512K+. $44.95. PAR Software, PO Box 1089, Vancouver, WA 98666. NCP (Apr 88)

Eureka: The Solver is a free-form numerical equation solver. Standard trigonometric and logarithmic functions are available as is treatment of imaginary and complex numbers. $195. Borland International, 4585 Scotts Valley Dr., Scotts Valley, CA 95066. NCP (Mar 88)

Fastback for the Macintosh is hard disk back-up software that is very quick if not very efficient. Doesn't automatically exclude applications. Creates a seperate catalog disk. $99.95. Fifth Generation Systems, 1322 Bell Ave., Tustin, CA 92680. NCP (Apr 88)

Fedit Plus is the file and disk editor for everyone, from newest Mac owner to oldest. It can do more for your disks and files than any other application. Can recover deleted MFS files. If you own a Mac, get it. HFS-compatible. $49.95. MacMaster Systems, 108 E. Fremont Ave., #37, Sunnyvale, CA 94087. NCP (Sep 86)

Findswell is an indispensible utility that installs a new button in the Open Dialog box of virtually every Macintosh application. Press the button, type a search string, press Find and *Findswell* searches for any files that match. Click Open or double-click to open the correct file. Requires 512K+. $49.95. Working Software, 321 Alvarado, Monterey, CA 93940. NCP (Nov 87)

1stAid Kit HFS recovers lost or damaged files from floppy or hard disks. An excellent manual-turned-textbook actually teaches the Hierarchical File System. Requires 1M+. Version 2.2 reviewed. $99.95. 1st Aid Software, 42 Radnor Rd., Boston, MA 02135. NCP (Jun 88)

FlashBack is a utility to back up HFS hard disks onto floppies. A unique graphic display of the HFS directory facilitates file selection. The program can handle files larger than 800K. $59.95. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. NCP (Nov 86)

Font/DA Juggler Plus gives you unlimited access to almost any number of fonts, desk accessories, and sounds. Uses hierarchical menus. $59.95. Alsoft, PO Box 927, Spring, TX 77383. NCP (May 88)

Glue adds a print-to-disk capability to many programs. *ImageSaver* installs as printer driver; *Viewer* allows copying and printing of *Glue* files. Handy utility for desktop publishers. $59.95. Solutions International, Box 989, Montpelier, VT 05602. NCP (Dec 86)

Hard Disk Util uses patch files to allow users to mount and run specified programs on their hard disks. The list of patches is constantly expanding. $89.95. FWB Software, 2040 Polk St., San Francisco, CA 94109. NCP

HFS Backup ranks as one of the preferred hard disk backup utilities. Back up by file/folder or last changes. Backup specifications

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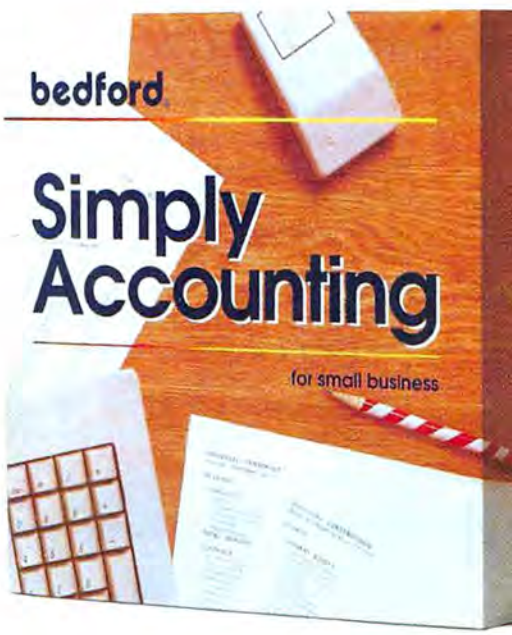
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can be saved as templates. Good graphic interface. Reliable program. $49.95. PCPC, 4710 Eisenhower Blvd., Tampa, FL 33634. NCP (Dec 86)

HFS Locator Plus is *the* essential HFS desk accessory. It can ★★★★ search for a file by name or date of creation, create folders, move files from one folder to another, set a program to launch while in an application. $39.95. PBI Software, 1163 Triton Dr., Foster City, CA 94404. NCP (Sep 86)

Icon-It! (v. 1.0) lets you create icons to use as an alternative to ★★★★½ menu commands. Comes with 47 icon templates or you can create your own. $79.95. Olduvai Software, 7520 Red Rd., South Miami, FL 33143. NCP (Feb 88)

LabView automates the repetitive task of controlling laboratory ★★½ instruments. Rich icon-based language allows flow chart-type programming, but response is slow. Requires 512K+. $1995. National Instruments, 12109 Technology Blvd., Austin, TX 78727. NCP (Aug 87)

LaserServe is a printer spooler for AppleTalk networks. After instal- ★★★★★ lation all operations done via a desk accessory. Works with both *MacServe* and *TOPS*. Requires 512K+ and 800K drive or hard disk. $95 per node. Infosphere, 4730 SW Macadam Ave., Portland, OR 97201. NCP (Feb 87)

Mac Disk Catalog II is a utility that will quickly organize a moderate ★★★★ size disk library. Easy to use with powerful reporting and label-making features. $49.95. New Canaan MicroCode, 136 Beech Rd., New Canaan, CT 06840. NCP (Dec 85)

MacFlow is a design tool created for programmers. Traditional flow- ★★★½ charting symbols are linked together, and a symbol can be connected to a separate flowchart file. Symbols can't be edited, precluding using *MacFlow* for other applications. $125. Mainstay, 5211-B Derry Ave., Agoura Hills, CA 91301. NCP (Apr 87)

MacInUse tracks time spent in applications and saves info as text ★★★★★ files. Installs on any disk, works in background. MFS, HFS compatible. Extremely valuable for tax purposes, client records, etc. $79. SoftView, 4820 Adohr Lane, Camarillo, CA 93010. NCP (Jan 87)

MacLabeler lets users instantly index and print labels for all the ★★★½ disks in a burgeoning collection. Choose border type and orientation of your label; index by folder or document. Starter set of labels is included. $49.95. Ideaform, PO Box 1540, Fairfield, IA 52556. NCP (Prem)

MacNosy is a global disassembler. A very advanced user can ★★★★★ use this program to look into the code of virtually any program. This advanced tool can take you places no other Mac program could dream of going IF you have the skill to guide it. The documentation is sparse. For pros only. $90. Jasik Designs, 343 Trenton Way, Menlo Park, CA 94025. NCP

MacSafe is a data file security program that allows you to place ★★★★ multiple files into a "safe," and then you can further protect them through two types of encryption (including DES). Flexible and very easy to use. Allows for installation on hard disk. $149.95. Kent Marsh Ltd, 1200 Post Oak Blvd., Houston, TX 77056. CP (Mar 87)

MacServe converts a Mac and a hard disk into a disk and print ★★★★½ server. Uses the AppleTalk network and is easily hooked up. Users can partition the hard disk into multiple volumes.

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Runs in the background, so users can work on all machines in the network. $250. Requires 512+. Infosphere, 4730 SW Macadam, Portland, OR 97201. CP

MacTree displays your files in the form of a hierarchical tree. Good ♦♦♦½ idea, poor performance. Can't view tree easily. Good search function. Requires 512K+. $69.95. Software Research Technology, 22901 Mill Creek Dr., Laguna Hills, CA 92653. NCP (Apr 88)

MacZap is a three-part disk and memory utility. It can be used to ♦♦♦♦ recover some damaged files and disks, compare disks, analyze disk structure, and make back-up copies of most disks. $60. Micro Analyst, 2505 Roxmoor, Austin, TX 78723. NCP (Jan 86)

Menu Fonts displays the names of fonts in the actual font instead of ♦♦♦ standard Chicago. Won't work with programs that have a nonstandard Font menu or no Font menu. Comes with *Lock-Out*, a utility that gives password access to your Mac, and *FastFormatter*, a utility for formatting multiple blank disks. Requires 512K+. $15. Beyond Software, 3865 N. Oracle Rd., Tucson, AZ 85705. NCP (Jul 87)

myDiskLabeler is an excellent label maker. It can read directories ♦♦♦♦ and use large or small icons or anything desired. Comes with 54 precut labels. $44.95; with color printing ability (on the ImageWriter II), $54.95; with PostScript font capability (on the LaserWriter), $64.95. Williams and Macias, PO Box 19206, Spokane, WA 99219. NCP (Aug 87)

'Ncryptor is a simple safe program that lets users password ♦♦♦♦ their files. The same program is used for encoding and decoding. This is one of the best products in its category. $39.95. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. NCP

Packit III is an essential utility. Primarily used to temporarily "glue" ♦♦♦♦½ files together, it can also compress and encrypt. Feeware. $10, $10 for printed manual. Harry R. Chesley, 1850 Union St., San Francisco, CA 94123. NCP (Jan 87)

PowerStation is an extremely easy-to-use, versatile and powerful ♦♦♦♦♦ *Finder* substitute. Loaded with power user features. Comes with *Pyro!* $59.95. Software Supply, 599 N. Mathilda Ave., Suite 210, Sunnyvale, CA 94086. NCP (Dec 87)

Printworks for the Mac is a comprehensive software-based dot-♦♦♦♦ matrix printer control system. Optimizes printing from different applications, and is easy to use. Requires 512K+. $75. SoftStyle, 7192 Kalanianaole Hwy., Honolulu, HI 96825. NCP (Aug 87)

Programmer's On-line Companion puts an abridged version ♦♦♦ of *Inside Macintosh* in your system for reference. Simply read the text or transfer some or all of it directly into your normal editing window. Non-Macish interface makes the program confusing, somewhat difficult to use. $34.95. Addison-Wesley, Route 128, Reading, MA 01867. NCP (Jul 87)

Quick & Dirty Utilities, Volume One is a disk full of handy pro-♦♦♦♦½ grams. Several desk accessories include a menu bar clock and a terminal emulator. $39.95. Dreams of the Phoenix, PO Box 10273, Jacksonville, FL 32247. NCP (Nov 85)

QuicKeys lets you make full use of your keyboard. Assign any com-♦♦♦♦ mand (menu choices, DAs, etc.) or series of text blocks and/or command to any key or key combination. Enormously

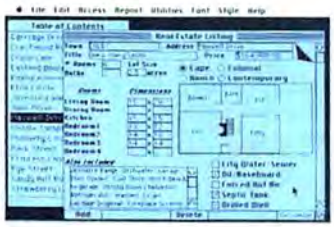
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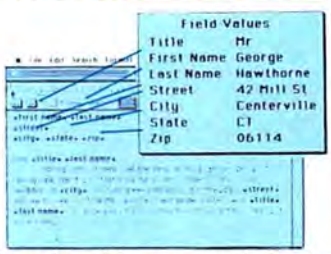
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powerful; necessary for Apple Extended Keyboard owners. Requires 512K+. $99.95. CE Software, 801-73rd St., Des Moines, IA 50312. NCP (Jan 88)

RamSnap is a RAMdisk and disk cache in one easy-to-use ★★★★ package. Can store multiple configurations as files. Good product but a little pricey. $59.95. Dove Computer Corp., 1200 North 23rd St., Wilmington, NC 28405. NCP (Jun 87)

Read-it! (v. 1.0) is the best consumer value in optical character ★★★★ recognition software. Works with any scanner that saves images as a bit map, PICT or TIFF file. Comes with type tables that can be customized. Version 1.1, $395; ThunderScan version, $149.95. Olduvai Software, 7520 Red Rd., South Miami, FL 33143. NCP (Apr 88)

Sentinel encrypts data files (or sets of files) using a super-secure ★★★★ DES or a super-fast SuperCrypt algorithm. Provides high-level security if you can keep your passwords secret. Requires 1M+. $149.95. SuperMac, 295 N. Bernardo Ave., Mountain View, CA 94043. NCP (Apr 88)

SmartScrap and The Clipper are two useful desk accessory utili- ★★★★½ ties for graphics work. *SmartScrap* is a major enhancement to the standard Scrapbook DA. *The Clipper* provides you with a transparent Clipboard window, allowing you to resize or crop a graphic to the area that it will be pasted to. $59.95. Solutions International, PO Box 989, Montpelier, VT 05602. NCP (Jul 87)

SoundWave is a useful sound recording and editing utility. Works ★★★★ with waveforms; able to change sampling rates. Previously known as *SoundCap*. $199.95. Impulse, 6870 Shingle Creek Parkway, Minneapolis, MN 55430. NCP (Apr 88)

Stepping Out is a software virtual screen extender. Lets you create ★★★★★ a screen as large as memory allows. 9-inch screen is a "view" to larger screen. Also has reduction features. Amazing. $95. Berkeley System Design, 1708 Shattuck Ave., Berkeley, CA 94709. NCP (Mar 88)

Suitcase is a transparent program that automatically lets you use ★★★★★ all your fonts and DAs. Foolproof and indispensible. Comes with *Pyro!*, the best screen saver. Requires 512K+. $59.95. Software Supply, 599 N. Mathilda, Sunnyvale, CA 94086. NCP (Nov 87)

SuperLaserSpool is a LaserWriter spooler. Very fast because ★★★★ it does conversion to PostScript in the background, but doesn't print a faithful rendition of *PageMaker* documents as a result. $149.95 single user, $395.95 for up to five users on one network. SuperMac Software, 950 N. Rengstorff Ave., Mountain View, CA 94043. NCP (Jun 87)

Switcher is Andy Hertzfeld's contribution to Mac productivity. ★★★★★ This program lets users run several programs at once (up to 8 on a 1-megabyte or larger machine). Switching between the programs is nearly instantaneous. Requires 512K+. $19.95 from Apple, free from BBSs, included with some third-party applications. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. NCP (Jun 86)

Tempo is a desk accessory that allows most Mac commands to be ★★★★ intelligently recorded and played back. Capabilities include

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pausing, conditional branching, and macros that work between applications. $99. Affinity Micro Systems, 1050 Walnut St., Boulder, CO 80302. NCP (Jul 86)

TMON is *the* debugger for the Mac. This isn't open to question. ★★★★★ *TMON* is simply the best. Comes with the latest version of Darin Adler's Extended User Area. $149. ICOM Simulations, 626 Wheeling Rd., Wheeling, IL 60090. NCP

Turbo Download is a desk accessory designed specifically to increase the speed of Xmodem data transfers from national databases to your Mac. Speed increases range upward from 50% to over 300% at 2400 baud. $39.95. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. NCP ★★★★½

Twelve-C Financial Desk Accessory brings all the power and functionality of a Hewlett-Packard 12C programmable calculator to your desktop. Can be programmed and all registers can be viewed while calculator is running. $39.95. Dreams of the Phoenix, PO Box 10273, Jacksonville, FL 32247. NCP ★★★★

TypeNow is a desk accessory that allows the Mac and ImageWriter to function as an electronic typewriter. Type can be placed into blanks in complex forms easily. Typing can be recorded and played back. $39.95. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. NCP (Jan 86) ★★★★

WorksPlus Command lets you build and define macros for all *Works* modules. Predefined macros provide for an even tighter integration of program's word-processing, spreadsheet, and database modules. Requires 1M+. $99.95. Lundeen & Associates, PO Box 30038, Oakland, CA 940604. NCP (May 88) ★★★★

LANGUAGES

AAIS Prolog is a fast standard Prolog with excellent debugging and error handling. Good for serious program development. Documentation is not as good as the program. $150. Advanced AI Systems, PO Box 39-0360, Mountain View, CA 94039-0360. NCP (Mar 87) ★★★★

Aztec C is a C language that will appeal to users with a UNIX background. It uses many UNIX conventions and in the more expensive versions comes with standard UNIX utilities, including the VI editor. $75 beginners, $199 basic system, $299 development system, $499 commercial system. Manx Software Systems, PO Box 55, Shrewsbury, NJ 07701. NCP (May 86) ★★★★

Basic Compiler is the long awaited compiler for *Microsoft BASIC*. The interface is unfriendly, but it gets the job done. Compiled programs run faster, but you can still tell they are written in BASIC. $195. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. NCP (May 87) ★★★½

ExperCommon Lisp is a LISP development system. Not fully Common LISP compatible, but creates good compiled code and standalone applications. Requires 1M+. $995. ExperTelligence, 559 San Ysidro Rd., Santa Barbara, CA 93108. NCP (Aug 87) ★★★

ExperLISP is a useful programming language for high-level programmers. The more you use it, the more you'll figure out about it. $495. Requires 512K+. ExperTelligence, 559 San Ysidro Rd., Santa Barbara, CA 93108. CP ★★★

ExperLogo is a version of the popular teaching language, Logo. Features three-dimensional graphics using "bunnies" rath- ★★★

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er than usual "turtles." Very speedy, smooth program. Comes with an excellent manual. $149.95. ExperTelligence, 559 San Ysidro Rd., Santa Barbara, CA 93108. CP

ExperProlog II is a Prolog based on the new Prolog II standard. Has
♦♦♦ the ability to handle infinite trees and allows user-defined functions that operate conditionally. Documentation is not the best and Mac interface is nonstandard. $495. ExperTelligence, 559 San Ysidro Blvd., Santa Barbara, CA 33108. NCP (Mar 87)

Lightspeed C provides an integrated environment for developing
♦♦♦♦½ desk accessories, applications, and code resources in C. The editor works with the compiler for searches and file management. Can get awkward if you need something outside the environment. $175. Think Technologies, 135 South Rd., Bedford, MA 01730. NCP (Apr 87)

Lightspeed Pascal is a fast, powerful development system for
♦♦♦♦♦ Pascal programming. Fully integrated Mac-like environment. Requires 512K+. $125. Think Technologies, 135 South Rd., Bedford, MA 01730. NCP (Feb 87)

LPA MacProlog (v. 2.0) is a much improved program that includes
♦♦♦♦ incremental and optimizing compilers, a graphics environment package, and C and Pascal submodules. Requires 1M+. $495. Programming Logic Systems, 31 Crescent Dr., Milford, CT 06460. NCP (Feb 88)

MacAsm is a software development system that allows programs
♦♦♦ to be written in assembly language. Programmers can assemble, edit, and test software, and an integrated resource compiler lets independent applications run from their own icons. $125. Mainstay, 5311-B Derry Rd., Agoura Hills, CA 91301. NCP

Mac C is a good, highly Mac-oriented implementation of this popular
♦♦♦♦ development language. Assembler and linker included. $425. Consulair, 140 Campo Dr., Portola Valley, CA 94025. NCP

MacExpress is a development environment or shell. Programmers
♦♦♦ use it to save time and effort when developing standalone applications for the Mac. $195. ALSoft, PO Box 927, Spring, TX 77383. NCP (Feb 86)

MacForth Plus is an excellent implementation of the popular Forth
♦♦♦♦ programming language. New, reduced price, $199. Creative Solutions, 4701 Randolph Rd., Rockville, MD 20852. NCP

Mach II is a multitasking implementation of Forth that allows local
♦♦♦♦ variables and text files. Can create standalone applications. Several windows can be up with different operations in each, operating concurrently. Execution is fast. $99.95. Requires 512K+. Palo Alto Shipping, PO Box 7430, Menlo Park, CA 94026. NCP (Apr 86)

Macintosh 68000 Development System is a fairly traditional as-
♦♦♦♦ sembly language package. The two-disk set provides an editor (*Edit*), an assembler, a linker, an executive, and a resource compiler. $195. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. NCP

Macintosh Pascal is Apple Computer's version of this very popular
♦♦♦ programming language. Loaded as it is with innovative teaching features, this interpreter is an excellent introduction to Pascal. $125. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. CP

MacScheme is a LISP dialect with "artificial intelligence" capabili-
♦♦♦ ties. Has a large appetite for RAM. Interpreted language with Toolbox access limited to a small part of QuickDraw. $125. Semantic Microsystems, 4470 S.W. Hall St., Beaverton, OR 97005. NCP (Jun 86)

MacScheme+Toolsmith is a Mac version of Scheme, a LISP dia-
♦♦♦♦♦ lect. Beautiful implementation, marred only by relative slowness compared to similar products. Get *Toolsmith*. Requires 1M+. $395. Semantic Microsystems, 4470 S. W. Hall, Beaverton, OR 97005. NCP (Aug 87)

Megamax C is an easy to use, full version of C. Has a compiler,
♦♦♦♦ linker, disassembler, editor, and much more. Good for beginners. Excellent documentation. $299.95. Megamax, PO Box 851521, Richardson, TX 75085. NCP

Microsoft BASIC was the Mac's first programming language. This
♦♦♦♦ interpreter (it's not a compiler) now supports the Toolbox and the whole Mac interface can be implemented in your programs. For nonprogrammers there are lots of programs available. $99. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. NCP

MIDIBasic is a library of simple, but highly useful routines for writing
♦♦♦♦ MIDI software. Good stuff. Sketchy documentation. Works with both *Microsoft* and *ZBasic*. Requires 512K+ plus BASIC. $49.95. Altech Systems, 831 Kings Highway, Shreveport, LA 71119. NCP (Aug 87)

Object Logo is an object-oriented programming language with ac-
♦♦♦♦ cess to the Toolbox. Good product, but can't produce standalone applications. Requires 512K+. $79.95. Coral Software, PO Box 307, Cambridge, MA 02142. NCP (Aug 87)

Personal Prolog is an inexpensive and well-documented program.
♦♦♦♦ Has no debugging or search and replace facilities, making it a more appropriate tool for learning than development. Documentation and use of Mac interface are excellent. $64.95. Optimized Systems Software, 1221 B Kentwood Ave., San Jose, CA 95129. NCP (Mar 87)

Prolog/m is a solid Prolog following the Edinburgh standard. Has
♦♦♦♦ extensive debugging facilities, but you'll need separate *Toolbox* disk with 58 additional predicates. Drawback: no true editing or printing facilities. $99.95. Chalcedony Software, 5580 La Jolla Blvd., La Jolla, CA 92037. NCP (Mar 87)

QUED (Quality Editor for Developers) is the ultimate source code
♦♦♦♦ editor. Loaded with useful and well thought out features, it will make any programmer's life much easier. It is not a word processor, however. $65. Paragon Concepts, 4954 Sun Valley Rd., Del Mar, CA 92014. NCP (Mar 86)

TML Data Base Toolkit is an ISAM type database that provides fast
♦♦♦♦ and efficient administration of large data files in applications developed with *TML* compiler. Supports multiple open index files. $89.95. TML Systems, 4241 Bay Meadows Rd., Jacksonville, FL 32217. NCP (Dec 86)

TML (MacLanguage Series) Pascal is a good Pascal compiler,
♦♦♦♦♦ capable of producing standalone programs. Can use most existing Lisa Pascal programs with only slight modification. Requires 512K+. $99.95. TML Systems, 4241 Bay Meadows Rd., Jacksonville, FL 32217. NCP (Jun 86)

TML Source Code Library shows how to write programs that
♦♦♦♦½ use custom definition routines, speech, serial drivers, split bars, and other topics. Provided on three 400K diskettes. Requires *TML Pascal*. $79.95. TML Systems, 4241 Bay Meadows Rd., Jacksonville, FL 32217. NCP (Dec 86)

Visual Interactive Programming is a unique visual programming
♦♦♦♦ system for creating simple Macintosh applications. Programs are constructed in a flowchart-type manner. Easy access to most toolbox routines. Poor printing control. $124.95. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. NCP (Jun 87)

ZBasic is a fast, interactive compiler capable of creating standalone
♦♦♦♦ applications that take advantage of Mac's unique features and abilities. Includes *Edit*, *RMaker* and *MacInTalk*. Requires 512K+. $89.95. Zedcor, 4500 E. Speedway Blvd., Tucson, AZ 85712. NCP (Dec 86)

EDUCATION

Alphabet Blocks teaches prereaders the letters and sounds of the
♦♦♦♦♦ alphabet. The digitized voice of an on-screen elf is clear and pleasant. Very intuitive. Requires 1M+. $49.95. Bright Star

MINIFINDERS



Technology, 1003 111th Ave., Bellevue, WA 98004. NCP (May 88)

American Discovery is an interactive United States geography game that teaches states; capitals; and, in a roundabout manner, postal codes. Suffers from small maps. Requires 512K+. Great Wave Software, 5353 Scotts Valley Dr., Scotts Valley, CA 95066. NCP (May 88)

Business Simulator is a training tool in a simulation game. Make decisions that manage the company through several stages over 25 years. Decisions become more difficult over time. Requires 1M+, 2 disk drives (one must be 800K). May be run from a hard disk. $69.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. NCP (Dec 87)

ChipWits is a combination game and teaching tool. Players create programs to maneuver robots through a set of 8 mazes. The programs are written in *ChipWit*'s built-in icon-based programming language (IBOL). $49.95. BrainPower, 24009 Ventura Blvd., Calabasas, CA 91302. NCP

Course Builder (version 2.0) creates standalone educational applications. An easy-to-learn dedicated programming language uses blocks and arrows. Graphics, animation and sound can be integrated. Version 2 allows mathematical calculations. Poor documentation. $395, plus $10 shipping. TeleRobotics International, 8410 Oak Ridge Highway, Knoxville, TN 37931. NCP (Oct 87)

KidsTime is a package of five quality educational programs for children between the ages of 3 and 12. The programs all have adjustable difficulty levels. Some use speech and one is a nice introduction to musical notes. Sparse documentation. $49.95. Great Wave, 5353 Scotts Valley Dr., Scotts Valley, CA 95066. NCP (Oct 86)

LearnWord 3.0 is a three-part series of cassette tape/diskette modules that explain the intricacies of *Word* 3.0. They do the job, but remind you why cutting classes was more fun. $49.95 per module. Personal Training Systems, PO Box 54240, San Jose, CA 95154. (Apr 88)

LXR•Test generates tests from a database of questions. Makes it easy to modify and scramble test questions. Flexible output. Requires Mac 512E+, two 800K drives, or a hard-disk drive. $199 or $399, depending on features. Logic eXtension Resources, 9651 Business Center Dr., Rancho Cucamonga, CA 91730. NCP (May 88)

MacEdge and **MacEdge II** each contain 8 reading or math drill programs for basic skills. Programs follow one of three formats, a bit contrived. Contrivances are design flaws. $49.95 each. Think Educational Software, 16 Market St., Potsdam, NY 13676. CP

MacType offers structured typing instruction. Can teach both standard and Dvorak keyboards. Features include certificates for reaching certain levels. Can be used in a multistudent environment. $49.95. Palantir Software, 12777 Jones Rd., Houston, TX 77070. CP

MasterType is proof that learning to type can be fun. In this arcade-style action game words descend from four corners towards the center ship; the user must type them correctly. Features 18 skill levels, tracks errors, recommends lessons and provides comparison scores. $49.95. Mindscape, 3444 Dundee Rd., Northbrook, IL 60062. CP

Reader Rabbit teaches 4-to-8 year olds how to read in four elegant games that play and build off of each other. Requires 512KE+ and an 800K drive. Mac II and *MultiFinder* hostile. Version 2.0 reviewed. $59.95. The Learning Company, 6493 Kaiser Dr., Fremont, CA 94555. CP (Jun 88)

Sensei Physics is a capable, intelligent, well-designed study aid. Covers Vectors to Thermodynamics to The Nature of Light. Animated experiments let you try out concepts. Requires 512K+. $99.95. Broderbund Software, 17 Paul Dr., San Rafael, CA 94903. CP (Jan 88)

Subli-Mac is a self-hypnosis program, combining subliminal, relaxation, and positive-self-image techniques. Flashes a brief user-written message (against a diversionary pattern) at your subconscious. Dangerous near hard disks. Manual suffers from terminal California-ese. $39.95. Psy-Den, PO Box 248, Champlain, NY 12919. NCP (Jan 88)

ENTERTAINMENT

A Mind Forever Voyaging is a departure in text adventure games. It has a more extensive vocabulary and a more involved story than most of the genre. The story here is gripping, but there are only a few puzzles to solve. Requires 512K+. $39.95. Infocom, 125 CambridgePark Dr., Cambridge, MA 02140. NCP (Apr 86)

Alter Ego simulates the entire lifetime of a fictional character. The player's reaction to each multiple-choice event shape the character's future relationships, job, health, etc. Spectacular the first time you play; after that there are too many similarities to previous characters. $59.95. Activision, PO Box 7287, Mountain View, CA 94039. CP (Jun 86)

The Ancient Art of War gives users a chance to refight some famous campaigns on both strategic and tactical levels. Campaigns can also be designed from scratch. Very playable, addicting game. Requires 512K+ Mac. $44.95. Broderbund, 17 Paul Dr., San Rafael, CA 94903. CP (Apr 86)

Archon pits the forces of Light against Dark in a quest to gain control of five Power Points on a checkerboard grid. The shifting cycles of squares' colors keep the balance of power ever-changing. One or two players. $39.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. CP (Oct 86)

Balance of Power is the world's first computer peacegame. This simulation allows players to become either the President of the United States or General Secretary of the Soviet Union. Extraordinary artificial intelligence routines and general play make this a classic. $49.95. Mindscape, 3444 Dundee Rd., Northbrook, IL 60022. CP (Prem)

Battle Stations is a deceptively simple game based on the pen and paper game of *Battleship*. Requires strategy on several levels. Makes excellent use of Mac sound and graphics. Fun, casual game, especially when the Mac is one of the players. Requires 512K+. $30. Timeline, PO Box 60, Ypsilanti, MI 48197. NCP (Jun 87)

Beyond Zork is yet another installment in the famous *Zork* series of text adventures. Find the fabled Coconut of Quendor to restore failing magic in this expert-level game. On-Screen mapping and the Mac's window environment are taken advantage of. $49.95. Infocom, 125 CambridgePark Dr., Cambridge, MA 02140. NCP (Apr 88)

Borrowed Time casts players as detectives who have to solve their own murder — before it happens. This game requires players to think and act like a detective to solve the game. Good sentence parser, sketchy Mac interface. $44.95. Activision, PO Box 7287, Mountain View, CA 94039. CP (May 86)

Bridge 4.0 provides three other players and the cards for a game of rubber bridge. It's an average (Goren) bidder and a less than good card player. Good if it's the only game in town. Plays slowly since it's written in BASIC. $29.95. Artworx Software, 150 N. Main St., Fairport, NY 14450. CP (Sep 86)

Bureaucracy is a paranoiac text adventure that dares you to move to a new house and job and still maintain some degree of sanity, not to mention a low blood pressure. Written by Douglas Adams of *Hitchhiker's* fame. $39.95. Infocom, 125 CambridgePark Dr., Cambridge, MA 02140. NCP (Aug 87)

The Chessmaster 2000 is a masterful chess program that will appeal to both novice and master. You can view the board from 2- or 3-D perspective and turn the board for a better

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"MacCalc lets you dress up your spreadsheet..." — ***Publish!,*** *June, 1987*

"MacCalc's formatting features allow your spreadsheet to look more like pages from a finished report...brings the concept of publication-quality spreadsheets closer to reality." — ***InfoWorld,*** *June 22, 1987*

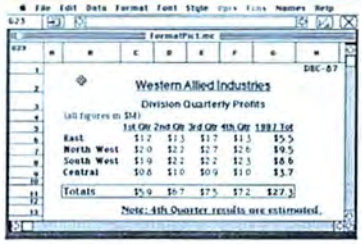
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MINIFINDERS



look. Play is smooth and easy, and the program responds by voice. You may get tired of hearing "Gotcha," though. $39.95. The Software Toolworks, 13557 Ventura Blvd., Sherman Oaks, CA 91423. CP (Jul 87)

Crystal Quest combines all the good elements of nearly every video ★★★★½ game ever made. Move a piece around to gobble up points and crystals. Shoot the nasties and get through the goal before they get you. Excellent sound effects. In color on the Mac II. Requires 512K+. Greene, 15 Via Chualar, Monterey, CA 93940. CP (Apr 88)

Dark Castle is an outstanding achievement in action games which ★★★★★ integrates RealSound with superb animation and graphics. You'll need better-than-average hand/eye coordination, but it's well worth the effort. Requires 512K+. $39.95. Silicon Beach, PO Box 261430, San Diego, CA 92126. NCP (Apr 87)

Deja Vu: A Nightmare Comes True is a graphic adventure that ★★★★★ breaks new ground. Innovative use of the Mac interface in truly playable and exciting game. A great introduction to graphic adventure games. $49.95. Mindscape, 3444 Dundee Rd., Northbrook, IL 60062. CP (Jan 86)

Dinner at Eight is a useful recipe filing system that includes a ★★★★ collection of recipes from a nationwide sampling of restaurants. Users enter number of diners and program scales recipes. $49.95. Rubicon, 2111 Dickson Dr., Austin, TX 78704. NCP (Jan 86)

Down Hill Racer is an action game with three skier personalities, ★★★★ four courses and four skill levels. There's something here for every player, no matter how bad or good. Full digitized sound (very nice!) $49.95. Miles Computing, 7741 Alabama Ave., Canoga Park, CA 91304. CP (Sep 87)

Enchanted Scepters is a surround sound graphic adventure game. ★★★★ It has a limited vocabulary and virtually no story. Offers extensive and varied scenes and utilizes the Mac interface to the fullest. $39.95. Silicon Beach, PO Box 261430, San Diego, CA 92126. CP (May 86)

Falcon simulates an F-16 fighter jet with gut-tightening, sweat-★★★★½ making realism. Go against MiGs and dodge SAMs scenarios. Requires 1M+. $49.95. Spectrum HoloByte, 2061 Challenger Dr., Alameda, CA 94501. NCP (May 88)

Ferrari Grand Prix is an exciting race car simulation game. Master-★★★★ ing it takes quite a bit of time and effort. Startup course and four other courses are built into the program. You can also design your own courses and backgrounds. Requires 512K+. $59.95. Bullseye Software, PO Drawer 7900, Incline Village, NV 89450. CP (Jul 87)

Flight Simulator puts you at the controls of a small plane (prop or ★★★★ jet) and lets you roam North America. As difficult as real flying. Mac version has features not found on earlier versions, including spotter aircraft. Not all features available on 128K. $49.95. Microsoft, 16011 NE 36th Way, Redmond, WA 98073-9717. CP (Nov 86)

Fokker Triplane is about as near to flying as you can get seated in ★★★★ front of a computer. Very realistic simulation and excellent graphics. Well-designed and implemented. $59.95. Bullseye Software, PO Drawer 7900, Incline Village, NV 89450. CP (Feb 86)

Gato puts players in command of an American submarine in World ★★★★½ War II. This superb simulation game uses all of the Mac's graphic capabilities to really make you feel that "you are there." $49.95. Spectrum HoloByte, 2061 Challenger Dr., Alameda, CA 94501. CP (Nov 85)

GO is the Chinese equivalent of chess. Players *plonk* markers ★★★½ on a grid to gain territory and outwit an opponent or the computer. Requires 512K+. Mac II hostile; *MultiFinder* friendly. Version 1.0 reviewed. $49.95. Infinity Software, 1144 65th St., Studio C, Emeryville, CA 94608. NCP (Jun 88)

Grand Slam is an absorbing and realistic tennis simulation game. ★★★★ Practice or play tournament against Mac-controlled players with different styles and abilities on four different surfaces. 512K or Mac Plus. $49.95. Infinity Software, 1331 61st St., Emeryville, CA 94608. CP (Nov 86)

Handwriting Analyst produces a personality profile base on an-★★★★½ swers to questions about one's handwriting. It's simple and the results will amaze and astound. $49.95. Ciasa, 2017 Cedar St., Berkeley, CA 94709. NCP (Apr 88)

HardBall is a baseball simulation game complete with umpire's ★★★★ calls and crowd sounds. Great graphics and a lot of fun for fans. $44.95. Accolade, 20813 Stevens Creek Blvd., Cupertino, CA 95014. CP (Feb 87)

Hollywood Hijinx substitutes a modern Hollywood estate for the ★★★★ famous Underground Empire, but otherwise represents a return to *Zork* gameplay and feel. There's even a maze to navigate. Simplistic, but good. $39.95. Infocom, 15 CambridgePark Dr., Cambridge, MA 02140. NCP (Jun 87)

Klondike 3.3 is a version of solitaire that uses video game-like ★★★★★ scoring to create a superb, totally addictive game. Simple to play, nearly impossible to stop playing. Shareware: $10. Unison Software, 415 Clyde Ave., Mountain View, CA 94043. NCP (Dec 87)

Leather Goddesses of Phobos is another in the long line of witty ★★★★★ and entertaining Infocom text adventures. This one lets you choose your sex and comes with a 3D comic and a scratch 'n sniff card. It has three levels of play: tame, suggestive and lewd. $39.95. Infocom, 125 CambridgePark Dr., Cambridge, MA 02140. NCP (Feb 87)

Lode Runner is a 150-screen action-strategy challenge. Move ★★★★ around a grid of ladders and platforms collecting treasure; dig a hole to trap pursuers. Build your own challenges. $39.95. Broderbund, 17 Paul Dr., San Rafael, CA 94903. CP

MacCourses adds four very challenging new courses to *MacGolf.* ★★★½ Courses are swapped on the original *MacGolf* master disk two at a time. Nice add-on for a good game. Requires *MacGolf.* $34.95. Practical Computer Applications, 1305 Jefferson Hwy., Champlin, MN 55316. CP (Apr 87)

MacGolf is a dynamic simulation of real golf. Players have a choice ★★★★½ of courses and difficulty levels. Superb playability makes this a must for all golfers and gamers. Requires 512K+. $59.95. Practical Computer Applications, 1305 Jefferson Hwy., Champlin, MN 55316. CP (May 86)

MacMan is a two-part package. The software portion is a decent ★★★★★ *PacMan*-like game. The hardware part is a tiny converter that lets you use a joystick with a Mac or Mac Plus. $39.95. Nuvo Systems, 225 Tank Farm Rd., San Luis Obispo, CA 93401. CP (Aug 87)

Mac Pro Football is a terrific sports simulation that gives you the ★★★★ chance to pit any combination of 38 Super Bowl teams against each other and direct team play. It comes with excellent, detailed (and necessary) documentation. Play selection can get a bit Byzantine. $49.95. Avalon Hill, 4517 Harford Rd., Baltimore, MD 21214. CP (Mar 87)

MacRacquetball uses digitized videos and sounds of professional ★★★½ players for a realistic simulation. Has lots of control settings and can be played against someone else over a modem or between hard-wired Macs. Turn off hard disks before playing. $59.95. Practical Computer Applications, 1305 Jefferson Hwy., Champlin, MN 55316. CP (Oct 87)

Maze Survival challenges players to destroy maze walls before ★★½ roving bugs squash themselves against it. Bugs lay eggs to spawn a new generation. Repetitive. $34.95. Olduvai Software, 7520A Red Road, South Miami, FL 33143. NCP (Aug 87)

MazeWars+ is an interactive, multiplayer game to be played on ★★★★ AppleTalk or through a modem link. Chase opponents through a four-level maze. Requires 512K+, AppleTalk or

MINIFINDERS



Hayes compatible modem. $49.95. MacroMind, 1029 W. Wolfam, Chicago, IL 60657. NCP (Nov 86)

MicEdGames is a collection of five educational games, MicAlphabetize, MicTime, MicStates, MicMatch and MicSpell, supposedly for ages 5 to adult. Games are sometimes cute but generally poorly designed. Manual is poorly written. Some entertainment value. $19.95. MicEdWare, 4265 Midland Rd., Saginaw, MI 48603. NCP (Dec 87)
★½

Mind Over Mac features five games. Entertainment for the whole family. Good graphics paired with synthesized sound and on-screen help. $49.95. Think Educational Software, 16 Market St., Potsdam, NY 13676. CP (Feb 86)
★★★★

MoonMist is an introductory level text adventure game. This is a typical haunted English castle story, not quite up to Infocom's best. It has four versions, so it's good for more then one play. $39.95. Infocom, 125 CambridgePar Dr., Cambridge, MA 02140. NCP (May 87)
★★★

MSFL: Pro League Football is a professional football league simulation that encourages people to play people, not the machine. Fast with lots of stats. Quirky MS-BASIC behavior. Spotty manual. No LaserWriter support. Requires 1M+. $49. MicroSports, PO Box 15799, Chattanooga, TN 37415. NCP (Apr 88)
★★★★½

NewGammon is animated backgammon that will challenge even good players. Features include variable skill levels and strategies and options to play the Mac or watch the Mac play itself. An arcade-like high speed mode is included. $39.95. Newsoft, PO Box 3046, Newport Beach, CA 92663. CP
★★★★

NFL Challenge simulates coaching and watching professional football. Comes on two disks, one with program and *System*, the other statistical data. Play against either human or computer coaching. Plays are selected from pre-defined playbooks. $99.95. XOR Corp., 5421 Opportunity Ct., Minnetonka, MN 55343. NCP (Jun 87)
★★★½

Ogre is a strategy tank game played on a hexagon grid. The ogre is an intelligent cybertank out to smash your command post. Customize your defense. Exceptionally good Mac interface. Has two-player option. $30. Origin Systems, 136 Harvey Rd., Building B, Londonderry, NH 03053. CP (Nov 87)
★★★★

Orbiter puts a real space shuttle on the Mac screen. A multitude of controls, intelligent on-board computer with speech capabilities, real-time graphics, and 16 distinct missions help this program succeed as both a game and a simulation. $49.95. Spectrum HoloByte, 2061 Challenger Dr., Alameda, CA 94501. NCP (Jul 86)
★★★★½

Orbquest is a fantasy role-playing adventure with better-than-average puzzles and an excellent sense of humor. Not as sophisticated as some, but a good value. $49.95. QWare, PO Box 850415, Richardson, TX 75085. CP (Dec 86)
★★★½

Patton vs. Rommel is a traditional-style strategic war game. It covers events in Normandy in 1944. While complex, it's well-designed and very playable. $39.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. CP (Apr 87)
★★★★

The Pawn is an unusual British interactive adventure game with text and graphics. The unique interface has some drawbacks, but *The Pawn* has humor, social satire, is entertaining, and is challenging. $44.95. Requires 1M+. Firebird, PO Box 49, Ramsey, NJ 07446. CP (Mar 87)
★★★½

Pinball Construction Set lets users create their own pinball games, as elaborate or as easy as desired. Uses *MacPaint* for backgrounds and has lifelike sounds (on 512K+ Macs). $39.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. CP (Jan 86)
★★★★

Plundered Hearts brings gothic romance to interactive fiction in the familiar Infocom mode of puzzles, mazes, and riddles. You play a 17th century heroine dodging pirates to rescue her wrongly imprisoned father. Medium diffiulty. $39.95. Infocom, 125 CambridgePark Dr., Cambridge, MA 02140. CP (Jan 88)
★★★½

Portal is an intriguing science fiction novel for kids that suffers from having a poor interface. Storyline: All of humanity is missing and you have to search through a database for files that reveal the mystery. Nothing in the way of role-playing, and the Mac version is slow and buggy. $49.95. Activision, PO Box 7287, Mountain View, CA 94039. CP (Oct 87)
★★★

Puppy Love is a combined game and teaching tool. As you teach your puppy tricks and routines, you learn the basics of programming logic. Great fun for all ages. Does not run from a hard disk. $29.95. Addison-Wesley, Route 128, Reading, MA 01867. CP (Mar 87)
★★★★½

Quarterstaff (v. 1.2) is a fantasy adventure game of the typical "good vs. evil" variety. Ability to use characters in other adventures gives this game a lot of potential for development. Requires 1M+. $49.95. Simulated Environment Systems, 800 South Pacific Coast Hwy., Redondo Beach, CA 90277. NCP (Mar 88)
★★★★

Seven Cities of Gold is an educational program masquerading as an adventure game and is practically unique in being equally good in both respects. You are to land (not the easiest part) in the New World and attempt to placate the natives, seed a few missions and collect gold. Nice work if you can get it. $39.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. CP (Jun 87)
★★★★

Shadowgate is an icon-based graphic adventure. You, as the seed of prophecy, must save the world from the evil warlock. Far surpasses all others with great animated graphics, sound, and adventure. $49.95. Mindscape, 3444 Dundee Rd., Northbrook, IL 60062. CP (Dec 87)
★★★★½

Shanghai challenges players to clear a board of all 144 tiles by matching pairs of mah-jongg tiles and removing them. Terrific strategic options plus the ability to randomly generate new game boards keep this one fresh. $44.95. Activision, PO Box 7287, Mountain View, CA 94039. CP (Nov 86)
★★★★★

Skyfox is a sophisticated 3D shoot-em-up. You're fighting tanks, planes and enemy cities floating in the sky. Fast graphics, good sound, slick, on-board attack computer and many levels of difficulty will keep fans of this genre happy for hours. $39.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. CP (Oct 86)
★★★

Smash Hit Racquetball is an accurate and entertaining simulation of a day on the courts. Digitized sound adds to the realism. Includes a hard-disk install, unusual for a game. The low price makes this the perfect Mac gift. $19.95. Primera Software, 650 Cragmont Ave., Berkeley, CA 94707. CP (Dec 86)
★★★★½

Snake-Bar lets you guide a snake (or train or semi) through a maze, picking up objects that feed and make your snake grow. Options include changing languages, editing the maze, and an X-rated game. $15. (shareware). Georges Malmound, 37 Bis rue des Abbesses, Montmartre, 75018 Paris, France. NCP (Dec 87)
★★★★

Solitaire Royale is a collection of eight solitaire card games. The Tour mode cycles through each game. Tournament deals the same hand for several players. $34.95. Published by Spectrum Holobyte, 2061 Challenger Dr., Alameda CA 94501. CP (May 88)
★★★★

Space Quest is a three-dimensional, animated adventure in which you play a janitor in a dicey situation. All you have to do is get off your ship before it explodes and save the Earnon System. Runs on any Mac. $49.95. Sierra On-Lin, PO Box 485, Coarsegold, CA 93614. CP (Sep 87)
★★★★

Star Fleet I: The War Begins! is a space opera of the *Star Trek* variety. Rise through the ranks from ensign to admiral in this serialized adventure. Requires 512K+. $55. Interstel, PO Box 57825, Webster, TX 77598. NCP (May 88)
★★★★

Stationfall is the sequel (finally) to Infocom's excellent *Planetfall* text adventure. Reunited with Floyd and sent to pick up requisition forms, you must solve the empty space station
★★★★½

MINIFINDERS



problem. As straightforward as other Infcom games; more so than some. $39.95. Infocom, 125 CambridgePark Dr., Cambridge, MA 02140. NCP (Nov 87)

Strategic Conquest Plus challenges you to discover an unexplored ★★★★½ world and conquer it by manufacturing and deploying armies, ships, and planes. A two-disk game that doesn't support an external drive. Requires 512K+. $59.95. PBI Software, 1111 Triton Dr., Foster City, CA 94404. CP (Feb 88)

Sub Battle Simulator is a superior naval combat game. Sixty different ★★★★ missions and the ability to link missions keep it from ever getting boring. Requires 512K+. $39.95. Epyx, PO Box 8020, Redwood City, CA 94063. NCP (Aug 87)

Tass Times in Tone Town is a slightly off-the-wall graphic adven- ★★★½ ture in which you need a flashy hairdo and a jumpsuit before you can get anywhere, and you pay for things with guitar picks. Decent puzzles, with a sense of humor. $4.95. Activision, PO Box 7287, Mountain View, CA 94039. CP (Jan 87)

The Toy Shop is a construction kit for building 20 different working ★★★★ model toys. Some parts can be customized. Manual gives clear instructions, but many toys are too complex for a child. $49.95. Broderbund, 17 Paul Dr., San Rafael, CA 94903. CP (Nov 86)

Trust & Betrayal: The Legacy of Siboot requires negotiating with ★★★★½ 6 artificial personalities in a struggle for power — not surprising considering that it comes from the maker of *Balance of Power*. Uses hieroglyphics to communicate in a fantasy world. Requires 512K+. Mindscape, 3444 Dundee Rd., Northbrook, IL 60062. CP (Mar 88)

Ultima III allows up to four characters to cooperate to explore the ★★★★½ vast wilderness of Sosaria. $59.95. Origin Systems, 340 Harvey Rd., Manchester, NH 03103. CP

Uninvited is an icon-based adventure game set in an extremely ★★★★★ haunted mansion. Since you access the parser by double-clicking, command choices are always visible — you don't waste time trying to figure out which words the program understands. It has animation and sound. $49.95. Mindscape, 3444 Dundee, Northbrook, IL 60062. CP (Sep 86)

Winter Games lets up to eight players compete against each ★★★★ other in Olympic events including figure skating, bobsledding, biathlon, and ski-jumping. Excellent animation, good graphics, good theme music. $39.95. Epyx, 600 Galveston Dr., PO Box 8020, Redwood City, CA 94063. CP (Mar 86)

Wizardry is an outstanding dungeon exploration adventure pitting a ★★★★★ party of up to six characters against the guardian monsters of the evil wizard Werdna. Capture his amulet to earn your reward. Even after solving the game, you'll want to go back into the dungeon. $59.95. Sir-Tech, Charlestown-Ogdensburg Mall, PO Box 245, Ogdensburg, NY 13669. CP

WordPlay is a word game with over 50 crossword puzzles for differ- ★★★★ ent levels of expertise. User friendly, it offers on-screen Help menus. A Work mode allows development of new puzzles for the creative. $49.95. Palantir, 12777 Jones Rd., Houston, TX 77070. NCP (Mar 86)

World Builder is an adventure game construction set with what ★★★★½ amounts to its own programming language. The whole program (language included) is easy to learn and produces commercial quality games. No support for the programming language, though. $79.95. Silicon Beach, PO Box 261430, San Diego, CA 92126. NCP (Apr 87)

Xyphus is a role-playing game pitting four characters (fighters or ★★★★ wizards) against multiple scenarios that grow increasingly harder. Excellent Mac interface and icon control. $39.95. Penguin, PO Box 311, Geneva, IL 60134. CP

Your Personal Poet creates personalized greeting cards on the ★★★½ Mac. Comes complete with four greeting cards and matching envelopes. Requires 512K+. $29.95. Computer Poet, 775 E. Greg St., Sparks, NV 89431. NCP (Jun 87)

Zork II is where the adventure continues in the underground em- ★★★★½ pire. A wandering wizard keeps things interesting, though there's a way to beat him if you persevere. $44.95. Infocom, 125 CambridgePark Dr., Cambridge, MA 02140. NCP

Zork III is the final chapter in the trilogy. Players come up against the ★★★ ultimate enemy — the Dungeonmaster himself. More closed-ended than previous *Zorks*. $44.95. Infocom, 125 CambridgePark Dr., Cambridge, MA 02140. NCP

MUSIC

Apple MIDI Interface is a simple Musical Instrument Digital Inter- ★★★ face with a 1 MHZ clock rate. Has only one MIDI input and one output. Works with all Macs; adaptor required for 128K and 512K. $99. Apple computer, 20525 Mariani Ave., Cupertino, CA 95014. (Jun 88)

ConcertWare+ is an enhanced version of *ConcertWare*. Has differ- ★★★★ ent instruments and can use any four of a set of eight at any point in a piece. Supports Adobe Sonata music font. $69.95. Great Wave Software, 5353 Scotts Valley Dr., Scotts Valley, CA 95066. NCP (Dec 87)

ConcertWare+MIDI is a composition and transcription program ★★★★ that can record multiple notes from a MIDI keyboard. Easy to use if you read music. Handles 8 tracks of 8 voices each. Requires 512K. Version 4.0. $149.95. Great Wave Software, 5353 Scotts Valley Dr., Scotts Valley, CA 95066. NCP (Dec 87)

Deluxe Music Construction Set lets you enter up to 48 voices on ★★★★ eight staves, and play the music through the Mac's internal speaker and/or via MIDI. Requires 512K+. Mac II and *MultiFinder* hostile. Version 2.0 reviewed. $99.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. CP (Jun 88)

Jam Factory is a program for performing complex manipulations on ★★★ MIDI data in real time. Unique, entertaining, and very powerful, but requires lots of patience and practice. Requires 512K+, MIDI interface, and MIDI synthesizr. $189. Intelligent Computer Music Systems, PO Box 8748, Albany, NY 12208. CP (Oct 87)

Listen is an educational tool for ear training. It has both a piano ★★★★ keyboard and a guitar fretboard for the student to input notes, and offers a wide range of exercises. $99. Resonate, PO Box 996, Menlo Park, CA 94026. (Jan 87)

M is a music composition and creation program that works with MIDI ★★★ data in real time. Unique, entertaining, and very powerful, but requires lots of patience and practice. Requires 512K+, MIDI interface, and MIDI synthesizer. $219. Intelligent Computer Music Systems, PO Box 8748, Albany, NY 12208. CP (Oct 87)

Master Tracks Pro is a full-featured, second-generation MIDI se- ★★★★½ quencer that adheres to the Mac interface very well. It's the first program to have graphic controller editing. Needs patch chasing for professional use, but it' still a rock-solid program. $350. Passport Designs, 625 Miramontes St., #103, Half Moon Bay, CA 94019. CP (Dec 87)

MIDIBasic is a simple, but highly useful routine for writing MIDI ★★★★ software. Good stuff. Sketchy documentation. Works with both *Microsoft* and *ZBasic*. Requires 512K+ plus Basic. $49.95. Altech Systems, 831 Kings Hwy, Shreveport, LA 71119. NCP (Aug 87)

Music Mouse is a music program in a genre all its own. Called an ★★★★★ "intelligent instrument," *Music Mouse* gives you instant musical feedback as you move the mouse and type on the keyboard, which controls tempo, vibrato, volume, etc. $59.95. OpCode Systems, 444 Ramona St., Palo Alto, CA 94301. NCP (May 87)

Performer (v. 2.2) is the definitive MIDI sequencer, and is priced ★★★★ accordingly. Includes looping, SMPTE synching, 32 simultaneous Ins and Outs, unlimited overdubbing, and compatibility with *Professional Composer* for transription. Requires

MINIFINDERS



MIDI interface and 512K+. $395. Mark of the Unicorn, 222 Third St., Cambridge, MA 02142. CP (Jan 88)

Practica Musica uses an interactive game and practice approach to teach music theory and ear training. Excellent training tool for the serious music student, it is also fun for anyone who wants to develop a trained ear for intervals, chords, and melodies. Requires 512K+. $125. ARS Nova Software, P.O. Box 40629, Santa Barbara, CA 93140. NCP (Nov 87)

Professional Composer produces performance-quality sheet music using Adobe's Sonata font. Scores can be created from scratch or imported from *Performer* (and can be exported to *Performer* for MIDI playback). Requires 512K+. $495. Mark of the Unicorn, 222 Third St., Cambridge, MA 02142. CP (Jan 88)

Studio Session consists of two programs, an Editor, and a Player, that produce music with six voices of digitized sound. Excellent program plus good manual make this a good buy. $89.95. Bogas Productions, PO Box 6699, Terra Lina, CA 94903-0699. NCP (Aug 87)

UpBeat turns the Macintosh into a front panel for a highly complex and versatile drum machine. Input patterns with mouse, MIDI Keyboard, or drum machine. Requires 512K. $150. Intelligent Music, PO Box 8748, Albany, NY 12208. CP (May 88)

HARDWARE & ACCESSORIES

AST TurboScan is a 300 dpi scanner with sophisticated graphics software. Scans at resolutions from 72 to 300 dpi. *SuperScan* software offers halftone, line art, and mixed modes. "Virtual memory processing" lets you scan images too large to fit in RAM. $1899. AST Research, 2121 Alton Ave., Irvine, CA 92714. Requires 512K+. *SuperScan* software included. NCP (Nov 87)

Classic Professional Graphics Display is a low-cost color monitor for the Mac II. Good value, but has an IBM-look about it. Green tint is annoying. Requires Apple video card. $549. Classic Components, 1490 Artesia Blvd., Gardena, CA 90247 (Jun 88)

CMS S-140 SCSI Hard Disk is a very fast, high-capacity SCSI hard disk with a unity interleave and average access time of 18 msec. Holds 140M. Help, file transfer, and tape back-up commands built in. *Hard Disk Partition* is a useful DA. Comes with a 6 ft. SCSI cable. $2995. CMS Enhancements, 1372 Valencia Ave., Tustin, CA 92680. (Jul 87)

DASCH is an external RAMdisk available in half, 1, and 2M sizes. Connects to a serial port. Speeds up operations 200 to 300%. Can be used as a printer buffer. Works with all Macs. 512K, $395; 1M, $450; 2M, $545. Western Automation-Laboratories, PO Box 3438, Boulder, CO 80307. (Feb 87)

Data Frame 40XP is a very fast, very quiet 40-meg external SCSI hard drive. Comes with a good and complete set of utility software. About as fast as a SCSI drive can be. Requires SCSI port, 512K+, new ROM. $1899. SuperMac Technology, 295 N. Bernardo Ave., Mountain View, CA 94043.

DaynaFile hooks up to a SCSI drive to read MS-DOS disks in the Mac environment. Use Mac applications to manipulate data created with an IBM PC. Comes in both 5-¼ and 3-½ inch formats. $595 for single floppy. Dayna Communications, 50 S. Main St., 5th Floor, Salt Lake City, UT 84144. (Jan 88)

FX-20 is a good 20-meg external hard drive. Good utility software. Reliable and reasonably quiet. Sits next to Mac, has a large, oddly shaped case. Requires SCSI port, 512K+, new ROM. $1199. General Computer, 215 First St., Camridge, MA 02142. (Feb 87)

Hard Disk 20SC is Apple's 20-meg SCSI hard disk. Reliable, fairly noisy unit. Good utility software, but no back-up yet. Requires cable and terminator ($80). Requires SCSI port, 512K+, new ROM. $1299. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. (Feb 87)

Hewlett-Packard ColorPro Graphics Plotter is an eight-pen desktop plotter that requires third party software to drive it. Fonts are limited to an optional Graphics Enhancement Cartridge that requires some BASIC programming. $1295. Hewlett-Packard, 16399 W. Bernardo Dr., San Diego, CA 92127. (Feb 88)

ImageMaker shoots 35mm color slides direct from the Mac. Supports most presentation software. Uses patterns to represent colors. Not fully compatible with the Mac II. Requires 512K+. $4995. *MacDriver* software, $149. Presentation Technologies, 743 North Pastoria Ave., Sunnyvale, CA 94086. (Feb 88)

IS/ONE tablet with **Penworks** software lets you use a corded or cordless pen or mouse and a high-res tablet for precise graphics input. Minor bugs with some applications and DAs. Keystroke macros can be launched from the tablet. Minimal documentation. Requires 1M+. $595 to $1145. Kurta, 4610 S. 35th St., Phoenix, AZ 85040. (Jan 88)

Jasmine Direct Drive 50 is a very quiet 1:1 interleave 50 megabyte hard drive and one of the fastest SCSI drives around. A small fan keeps it cool, but it's still quiet. $1159. Jasmine Technologies, 555 De Haro St., San Fransisco, CA 94107. (Mar 88)

LaserWriter II NT is Apple's mid-priced PostScript laser printer. It's faster than the LaserWriter Plus, with blacker blacks. Gray scale is less even than that of Plus. Requires 512K+. $4599. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. (May 88)

Laser Writer II NTX is Apple's top-of-the-line PostScript laser printer. 68020 chip makes it very speedy; expandable to 12M; SCSI hard disk can be attached for fonts. Requires 512K+. $6599. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. (May 88)

LaserWriter II SC is Apples's low-end QuickDraw laserprinter. Can be upgraded to NT or NTX; reasonably fast. Requires 1M+. $2799. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. (May 88)

MacBottom 45 SCSI and Internal Modem has a modem that fits into the top half of the 45-megabyte SCSI hard drive case. Comes with *HFS Backup* and *Eureka*. $1795. Personal Computer Peripherals, 4710 Eisenhower Blvd., Tampa, 33634.(Oct 87)

MacBottom HD21 is a very low (about 2 inches high), external 20-meg hard drive. Fits under the Mac. Very quiet, very reliable. Good utility software, including *HFS Backup*. Requires SCSI port, 512K+, new ROM. $1195. PCPC, 4710 Esenhower Blvd., Tampa, 33634. (Feb 87)

MacCharlie's components slip around the Mac and convert it into an IBM PC clone. Amazingly, it works well. The enlarged keyboard has a few bugs but is a joy to use. $995. Dayna Communications, 50 S. Main St., Salt Lake City, UT 84144. (Dec 85)

Macintizer is a graphics tablet and absolute positioning device that replaces the mouse. Various scales are possible. $599. GTCO Corp., 7125 Riverwood Dr., Columbia, MD 21046.

MacLarger is a 12-inch external monitor for 512K machines on up to the SE. Displays the same number of pixels as an internal monitor, only one-third larger. Bigger and brighter, but less crisp than the Mac's own screen. $449. Power R, 1606 Dexter Ave. North, Seattle, WA 98109. (Apr 88)

MacRecorder is an easy-to-use sound digitizer. Includes software to turn sounds into *HyperCard* buttons, mix sounds, add special effects, and convert sound formats. Stereo recording possible on a Mac II. Requires 512K+. $199, Farallon Computing, 2150 Kittredge St., Berkeley, CA 94704. NCP (Jun 88)

MINIFINDERS



MacSnap Plus 2 is a 2M memory upgrade for the Mac Plus. The ★★★★ board has 256 kilobit chips. User installable. Not compatible with existing big screens or internal hard disks, and can't be expanded further. $399. Dove Computer, 1200 North 23rd St., Wilmington, NC 28405. (Jun 87)

MacTable is an elegant Danish worktable that holds a Mac ★★★★½ and printer with room to spare. The 30-inch deep by 60-inch wide table is made of particleboard and must be assembled. Cabinet is optional. Table, $289; cabinet, $139. ScanCoFurn, PO Box 3217, Redmond, WA 98073-3217. (Mar 88)

MacTablet is a stylus-driven graphics tablet. Users can easi- ★★★★ ly sketch or trace art using this absolute-positioning device. Has a working area the size of the Mac screen. Allows concurrent use of the mouse. $495. Summagraphics Corp., 777 State St. Extension, Fairfield, CT 06430. (Jan 86)

MacTilt/MacTilt SE is a Mac (and external drive) holder that allows ★★★★ a full range of swiveling and tilting. Very strong, this well-made unit is also very easy-to-use. $99.95. Ergotron, PO Box 17013, Minneapolis, MN 55418.

MacVision is a digitizer that uses an ordinary video camera for ★★★★ input. Capable of extremely fine results and special effects. Easy to use and well-documented. $349.95. Koala, 269 Mt. Hermon Rd., Scotts Valley, CA 95066.

Mac-101 is a keyboard alternative that has a good feel to it. Has a ★★★★ keypad, 15 function keys, and more. The *101-Keys* desk accessory lets you define macros. Comes in an ADB version for the SE and II. Requires 512K+. $169.95. DataDesk International, 7650 Haskell Ave., Van Nuys, Ca 91406. Software NCP (Apr 88)

Magic Digitizer is a hardware digitizer that works with video cam- ★★★★ eras. With *LaserMagic* software you can generate 300 dpi images (in PostScript). Requires 512K+. Digitizer with *Magic* software, $399.95; *LaserMagic* software, $49.95. New Image Technology, 10300 Greenbelt Rd., Seabrook, MD 20706. NCP (May 87)

Microtek MSF-300C is a 300-dpi flatbed scanner. Really fast when ★★★½ used with optional MS-SCSI/C adapter. Comes with *VersaScan Plus* software (NCP) to scan and manipulate image. Saves images in a number of formats including TIFF and *MacPaint*. $1895. Microtek Lab, 16901 S. Western Ave., Gardena, CA 90247. (Dec 87)

Migent Pocket Modem is a 300/1200 baud portable modem ★★★½ about the size of a 3 X 5 index card. Comes bundled with *MacTerm* 2.0, Borland's telecom DA. Manual is confusing, and tech support is minimal. $259. Migent, 865 Tahoe Blvd., Incline Village, NV 89450-6062. (Nov 87)

Mouse Mover is a mouse pad-type surface that snaps onto the ★★★★½ bottom of the mouse like a roller skate, freeing it up to glide over desk or mouse pad with ease. 99 tiny ball bearings at three strategic points. Mouse glides faster and saves on mouse wear and tear. $19.95. Magnum Software, 21115 Devonshire St., Chatsworth, CA 91311.

Moustrak is a fabric covered foam mousing pad. It will increase the ★★★★ efficiency of your mouse while helping to keep it clean. Pad comes in a variety of colors. Particularly useful in the typical

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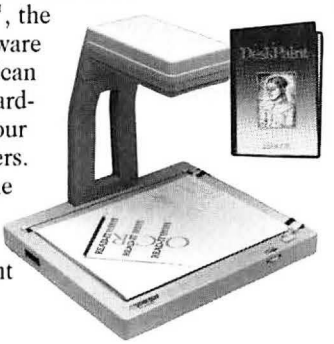
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AD INDEX

RS#	ADVERTISERS	PAGE
63	Aatrix Software	270
163	ABA Software, Inc.	36-37
82	Absoft	274
54	Access Technology	187
1	Activision	8-9
117	Adobe	82-83
NA	Adobe	153
44	Adobe	192-193
10	Alsoft	197
99	Altsys	283
40	AppleCrate	237
55	ARS Nova	254
124	Ashton-Tate	104-105
190	AST Research, Inc.	255
75	BASF	251
15	Bedford Software Corp	279
7	Bering Industries	78
23	Berkeley System Design	256
128	Borland International	45
158	Borland International	47
8	BrainPower, Inc.	90
76	Bravo Technologies Inc.	287
74	BudgetBytes	99
89	CDA Computer Sales	38
38	CE Software	249
9	Central Point Software	12
105	Central Point Software	153
183	Claris	128-129
NA	CMO	49-56
43	CMS Enhancements, Inc.	259
78	Compatible Systems	60
46	CompuServe	257
202	Computer Cover Co	265
36	Computer Friends	167
97	Computer Friends	269
106	Coral Software	292
134	Cricket	67-69
104	Cutting Edge, Inc.	281
95	Data Translation	44
155	DataViz Inc.	107
84	Deneba Software	247
53	Design Science	258
61	Digital Media	101
120	Diskette Connection	265
34	DPI	178
108	Dubl-Click	77
18	E-Machines	235
119	Educomp	39
187	Ergotron Inc.	C5
151	Everex Systems	64
4	Farallon	31
146	Fifth Generation Systems, Inc.	28
167	Fifth Generation Systems, Inc.	80
139	GDT Software Inc.	120
13	GEISCO	125
136	General Computer	119
26	Hardware House	60
NA	Image Club	277
3	Imagine That Inc.	30
27	Irwin Magnetics	19
58	Jasmine Technologies, Inc.	121
144	Kensington	C6
168	Kent Marsh Ltd.	23
168	Kent Marsh Ltd.	25
191	Laser Connection	16
173	Layered	41
66	Mac II Review	66
NA	MacConnection	218-223
83	MacLand	170
179	MacPeak	176-177
28	MacProducts USA	284
165	MacStore, Inc.	278
30	MacWarehouse	112-115
NA	MacZone	92-95
2	Mainstay	32
194	Manx Software Systems	81
181	Mass Micro	149
6	Mass Micro	151
88	Max Stax	132
145	Mega Graphics	273
122	Micro Planning	163
110	Microlytics	4
102	Microlytics	25
81	Micron Tech	111
NA	Microsoft Corporation	C2-3-4-P1
NA	Microsoft Corporation	145-147
NA	Microsoft Corporation	168-169
90	Microsoft Press	210
140	Microtech International	212-213
86	Mobius	120
186	MSC Technologies, Inc.	263
72	National Instruments	156
116	Nutmeg	261
149	Odesta	88
118	Olduvai Corporation	10
87	Open Mac Enterprises	186
16	Orange Micro	240
65	Orchid Tech	98
101	PCAI	18
141	Peripheral Land, Inc.	143
12	Personal Computer Peripherals Corp.	63
50	Personal Computer Peripherals Corp.	297
126	Personal Bibliographic	62
60	Personal Training Systems	205
184	Poster Dynamix	210
193	Precision Data Products	265
69	Programs Plus, Inc.	72-75
5	Public Domain Exchange	264
85	Quark, Inc.	165
154	Radius	20-21
92	Raster Ops	161
NA	Round Lake Publishing Co.	23
150	Safeware	258
157	SBT Corporation	227
64	Shana Enterprises Inc.	276
207	Sigma Designs	15
47	Software Discoveries	282
200	Software Library	35
177	Software Research	248
152	Software That Fits	198-201
80	Solutions International	61
161	Solutions International	109
39	Spectrum HoloByte	245
195	Sprite Tech	254
NA	SuperMac	280
147	Survivor Software Ltd.	87
204	Symantec/Living Videotext	175
197	Symantec/Think Technologies	11
170	Symantec/Think Technologies	24
93	Symantec/Turner Hall	22
73	Symantec/Turner Hall	133
49	Symmetry Corporation	14
62	T/Maker Company	59
29	T/Maker Company	189
166	Tektronix	181-183
NA	Texas Instruments	138-139
131	Thunderware	229
130	Tops	7
121	Traveling Software	40
33	Tri Data	70
11	True Basic	6
123	Tussey Computer Products	84
189	Tymlabs	6
153	UPTIME	5
109	USA Flex	264
178	Warp 9	97
115	Warp 9	293
175	Wenger	26-27
188	Williams & Macias	191
133	Word Perfect	154-155
160	Zericon	278

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 ☐ a) Mac Plus ☐ b) Mac SE ☐ c) Mac II
 ☐ d) IBM PC ☐ e) Other
2. For how many micro computers do you buy products?
 ☐ f) 10 or less ☐ g) 11-25
 ☐ h) 26 or more
3. Your primary job function is (Check one):
 ☐ i) Administrative/General Management
 ☐ j) MIS/DP, Communications Systems, Programming
 ☐ k) Engineering/R&D
 ☐ l) Finance/Accounting
 ☐ m)Marketing/Sales
 ☐ n) Computer Dealer/VAR
4. For which of the following products are you involved in selecting brands/models to be bought by your company or organization? (Check all that apply.)
 SOFTWARE: ☐ o) Accounting ☐ p) Spreadsheets/Financial Planners ☐ q) Project Managers ☐ r) Word Processors ☐ s) Database Managers ☐ t) Graphics ☐ u) CAD/CAM ☐ v) Communications
 HARDWARE: ☐ w) Mainframe ☐ x) Mini ☐ y) PC ☐ z) Printers/Plotters ☐ 1) Monitors ☐ 2) Disk/Tape Back-up ☐ 3) Add-in Boards ☐ 4) Communications
5. Are you involved in the purchasing of microcomputer equipment at your company? ☐ 5) Yes ☐ 6) No
6. If so, what function do you serve in the buying process?
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3 13 23 33 43 53 63 73 83 93	103 113 123 133 143 153 163 173 183 193	203 213 223 233 243 253 263 273 283 293
4 14 24 34 44 54 64 74 84 94	104 114 124 134 144 154 164 174 184 194	204 214 224 234 244 254 264 274 284 294
5 15 25 35 45 55 65 75 85 95	105 115 125 135 145 155 165 175 185 195	205 215 225 235 245 255 265 275 285 295
6 16 26 36 46 56 66 76 86 96	106 116 126 136 146 156 166 176 186 196	206 216 226 236 246 256 266 276 286 296
7 17 27 37 47 57 67 77 87 97	107 117 127 137 147 157 167 177 187 197	207 217 227 237 247 257 267 277 287 297
8 18 28 38 48 58 68 78 88 98	108 118 128 138 148 158 168 178 188 198	208 218 228 238 248 258 268 278 288 298
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2 12 22 32 42 52 62 72 82 92	102 112 122 132 142 152 162 172 182 192	202 212 222 232 242 252 262 272 282 292
3 13 23 33 43 53 63 73 83 93	103 113 123 133 143 153 163 173 183 193	203 213 223 233 243 253 263 273 283 293
4 14 24 34 44 54 64 74 84 94	104 114 124 134 144 154 164 174 184 194	204 214 224 234 244 254 264 274 284 294
5 15 25 35 45 55 65 75 85 95	105 115 125 135 145 155 165 175 185 195	205 215 225 235 245 255 265 275 285 295
6 16 26 36 46 56 66 76 86 96	106 116 126 136 146 156 166 176 186 196	206 216 226 236 246 256 266 276 286 296
7 17 27 37 47 57 67 77 87 97	107 117 127 137 147 157 167 177 187 197	207 217 227 237 247 257 267 277 287 297
8 18 28 38 48 58 68 78 88 98	108 118 128 138 148 158 168 178 188 198	208 218 228 238 248 258 268 278 288 298
9 19 29 39 49 59 69 79 89 99	109 119 129 139 149 159 169 179 189 199	209 219 229 239 249 259 269 279 289 299
10 20 30 40 50 60 70 80 90 100	110 120 130 140 150 160 170 180 190 200	210 220 230 240 250 260 270 280 290 300

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MINIFINDERS



office desktop environment. $10. Moustrak, 3047 St. Helena Hwy., St. Helena, CA 94574.

NetModem is a 1200-baud modem that can be accessed by all ★★★★ users on an AppleTalk network. The modem's display lights and the dial tone are simulated on screen. Requires 512K+. $599. Shiva, Suite 1200, 222 Third St., Cambridge, MA 02142-9919. (Feb 88)

NoLabelSystem is a plastic permanent labeling system in which ★★★★ users slide new tabs into a transparent plastic case on the disk. The tabs stick out of the case slightly, making them easier to read while in the drive. $19.45. Weber & Sons, 3468 Hwy. 9, Freehold, NJ 07728.

One Plus One is a user-installable memory upgrade for a Mac Plus. ★★★★½ Adds 1 megabyte of RAM to the 1M already there. Simple one-evening project. Includes MacBreeze, an excellent small fan. Requires Mac Plus. $375. Levco, 6160 Lusk Blvd., San Diego, CA 92121. (Aug 87)

Personal LaserPrinter is a non-PostScript laser printer at a great ★★★★ price. Clumsy workarounds required in some applications. Printing can be slow. Requires 1M+. $1999; Fonts Plus, $299. General Computer, 580 Winter St., Waltham, MA 02154. (Apr 88)

Personal Writer PW15 S is a tablet-based handwriting recognition ★★★★ system that also allows graphics and macros. Number of misread characters is too high for general word processing. Requires 1M+. $895. Personal Writer, 1801 Ave. of the Stars, Los Angeles, CA 90067. Software NCP (Mar 88)

PhoneNET is an AppleTalk-compatible network. Network can be up ★★★★★ to 3000 ft in length. In-place, unused phone cabling can be used for network, and can be combined with AppleTalk on same network. $49 per node. Farallon Computing, 2150 Kittredge St., Berkeley, CA 94704. (Dec 86)

QuickShare adds a SCSI port to an IBM PC for easy connec- ★★★ tivity with a Mac. Can use an IBM's hard disk to run Mac applications. Requires SCSI port. Mac II and *MultiFinder* friendly. Version 1.24 reviewed. $465. Compatible Systems, P.O. Drawer 17220, Boulder, CO 80308. (Jun 88)

SuperRam 2 and SuperRam 4 are 2- and 4-megabyte RAM up- ★★★½ grades. Should be dealer installed but can be (carefully) user installed. SuperRam 2 includes RAM adaptor module, 1-meg memory module, modified power cable, jumper and fan. SuperRam 4 adds power supply booster and two 1-meg memory modules. Not compatible with most big screens. $499. SuperMac Technology, 295 N. Bernardo, Mountain View, CA 94043. (Oct 87)

ThunderScan replaces the ribbon cartridge in an ImageWriter, ★★★★ which is required to use it. Laser scans art that can be run through the ImageWriter, producing high-quality digitized images. The images can be manipulated as they are created or afterward. $249. Thunderware, 21 Orinda Way, Orinda, CA 94563.

TimeWand is a bar-code reader with a built-in time/date stamping ★★★★ clock. Can be used with *TimeWand Manager* software, a database that's extensive though difficult to use. Poor docs, but good support. Requires 1M+. *TimeWand* 2K version, $198; *TimeWand Manager*, $489. Videx, 1105 NE Circle Blvd., Corvallis, OR 97330-4285. (Dec 87)

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ACCELERATOR BOARDS . .
ADD-ON-BOARDS 299
BAR CODE 299
CABLES
COMMUNICATIONS
COMPUTER SYSTEMS 299
DISKETTES 299
DISK DRIVES 300
ENGINEERING
EXPANSION UNITS 300
GENERAL 300
GRAPHICS
INSURANCE 300
MACINTOSH II 300
MEMORY UPGRADES 300-301
MONITORS 301
NETWORKING 301
PERIPHERALS 301
PLOTTERS
POWER PROTECTION
PRINTERS
SECURITY 301

SOFTWARE

ACCOUNTING 301-302
ARTIFICIAL INTELLIGENCE 302

SOFTWARE *continued*

BACKUP SYSTEMS
BUSINESS 302
BUSINESS TIME MANAGEMENT 302
COMMUNICATIONS . 302-303
COPY PROTECTION
DATA BASE
DATA MANAGEMENT
DESKTOP PUBLISHING 303
DEVELOPMENT TOOLS 303
DUPLICATION 303
EDUCATIONAL 303-304
EMULATION
ENGINEERING 304
ENTERTAINMENT/ GAMES 304-305
FINANCIAL 305
FONTS 305
FORMS PROCESSING
GENERAL
GRAPHICS 305-306
HEALTH
INVENTORY
LANGUAGE TOOLS 306
LEASING 306
LEGAL
MAIL ORDER

SOFTWARE *continued*

MEDICAL/DENTAL
MUSIC/MIDI 307
NETWORKING
ONE-OF-A-KIND
PAYROLL 307
PRINTER/PLOTTER DRIVERS 307
PUBLIC DOMAIN 307
REAL ESTATE 307-308
RELIGION
RENTAL
SALES MARKETING
SCIENTIFIC 308
SECURITY 308
SERVICES
SHAREWARE 308
STACKWARE 308-309
STATISTICS 309
TAXES
TERMINAL EMULATION
TYPESETTING
UTILITIES 309
WORD PROCESSING

MISCELLANEOUS

ACCESSORIES 309
BAR CODING
BUSINESS OPPORTUNITIES . . . 309-310
CAD CAM 310
COMPUTER INSURANCE 310
COMPUTER LEASING
COMPUTER SERVICES
COMPUTER TRAINING
CONSULTANTS
DATA CONVERSION SERVICES 310
DESKTOP PUBLISHING SERVICES 310
DIGITIZERS
EMPLOYMENT OPPORTUNITIES
FURNITURE 311
INSURANCE
LABELS 311
MAILING LISTS 311
NETWORKING
NOVELTIES
PUBLICATIONS 311
SCANNERS
SUPPLIES 311
USED EQUIPMENT

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DISK DRIVES
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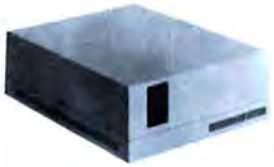
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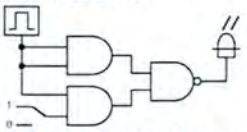
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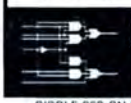
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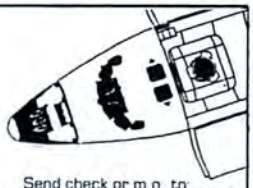
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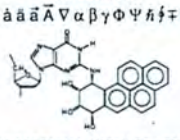


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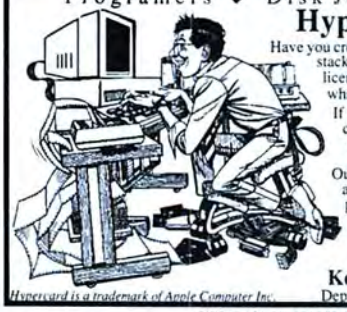
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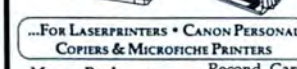
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The CD-ROM Burger King Column

by John C. Dvorak

It was the Third International CD-ROM Conference. Held in chilly Seattle, the conference was so, so dull I couldn't figure out how to report it and decided to let the reader do his or her own column. A Burger King version of the column: Have it your way. Make your own column. You can have four types of column: A) the pandering columnist who thinks Apple and the Mac is the greatest device ever invented; B) the cynical complainer column; C) the "what's this got to do with anything, anyway?" column — my personal favorite; or D) the never-ending summary and analysis column. In addition you may mix or match the various types to come up with something totally different.

Start by choosing a paragraph of your choice from the menu: How do you want the column to begin?

A) Apple is made up of a great bunch of guys and gals. And, boy-oh-boy, that Mac is one incredible machine, isn't it? Aren't we lucky to be part of it all? Well, things just got better with the new Apple CD-ROM disk drive that I saw at the CD-ROM Conference last March. Priced well below anything one could expect from Cray or Control Data, the $1195 cost is just what the doctor ordered.

B) Apple has got to be kidding. How could they introduce a CD-ROM drive at the outrageous price of $1195? Are they hoping that nobody buys the thing? If that's true, then why introduce it at all?

C) Bill Gates gave the keynote address at the CD-ROM conference. I can't remember what he said but I did notice that when he speaks in front of a large group he sounds like he's gargling.

D) The Third International CD-ROM Conference, held by Microsoft last March, had no highlights. At least they are consistent, because the first and second CD-ROM conferences had no highlights either.

Now among the following paragraphs choose the paragraph that you prefer as the "middle" of the article:

A) Bill Gates gave a great keynote address. He talked about all the neat things that the CD-ROM could do. He showed some examples of how the fabulous *HyperCard* could be used in a CD-ROM environment. It was pretty clear that CD-ROM and the Apple *HyperCard* working together are going to be fantastic!



B) Gates gave a keynote, a typical canned speech. Afterwards the attendees went to the exhibit hall where they were greeted by Japanese. Every vendor of Japanese compact disk players was at the conference showing us that they could sell the same mechanism as used in a compact disk player for 5 times as much money if they call it a CD-ROM player. It was a magic act. Since few of the Japanese spoke much English it was hard to argue about it.

C) Gates suffers from the regional speech peculiarities of Washington State, the state where they put a fried egg on a normal hamburger and consider it a gourmet hamburger. His pronunciations of "lie-berry" for library and "pitcher" for picture (not to mention the ten different ways he pronounced microprocessor) were distracting to say the least. None of this would be so bad if Gates hadn't felt the need to adjust his glasses every minute or two, drawing attention to the fact that they didn't fit and further drawing attention to himself.

D) Gates went out of his way to avoid mentioning the hated CD-I (compact disk interactive) format. You see, back two years ago Sony and Philips decided to promote a new format without consulting Bill. So he now promotes the renegade RCA/GE DVI format along with the original CD-ROM format eschewing the CD-I altogether. Don't look for too much objectivity at this conference.

Finally the wrap-up:

A) It looks like the CD-ROM conference is just the beginning. It shows us a new direction, a bright future, and some exciting times ahead. I'm so thrilled by it that I feel bubbly all over. I can hardly wait until next year's great conference.

B) If nothing else the CD-ROM scene is going nowhere fast. Perhaps the Japanese don't want to encourage any mass appeal with low prices. They'll be confronted with questions like, "What the heck is this good for?" and "What? $300 for a dictionary!?" I predict we'll see more of the same void next year.

C) This conference, which costs $400 to attend, spilled over into the Westin this year. They must have made a ton of dough. I ran into a fellow in Berkeley who, before the conference, told me how he looked forward to the conference for the food. While figuring this was a dumb thing to look forward to, I admitted that Microsoft knew how to feed the masses. We were surprised and dismayed to find that the good food is a forgotten memory. Microsoft, instead, had a mediocre and nearly inedible box lunch consisting of a stale roll with a thin slice of overcooked roast beef. Also in the box was a smallish container of potato salad, a bag of Eagle Snacks pretzels (undoubtedly contributed by nearby Boeing and taken from the galley of a repossessed Boeing 747 in exchange for an OS/2 developers kit), a chocolate bar, and a Coke.

D) It's pretty obvious that CD-ROM needs a *Lotus 1-2-3* or a *VisiCalc* or something compelling to make people want to buy one. Currently there is no direction and a lot of promises.

There you have it — nothing to report. It looks like something had better happen soon, because next year, if the scene doesn't improve, I'm going to write the same kind of column but with an optional answer: E) NONE OF THE ABOVE.

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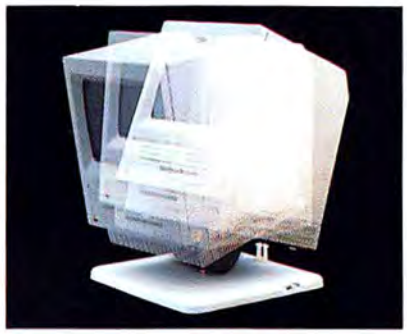
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